USDA United States
Department of Agriculture
Natural Resources
Conservation Service
Davis, California

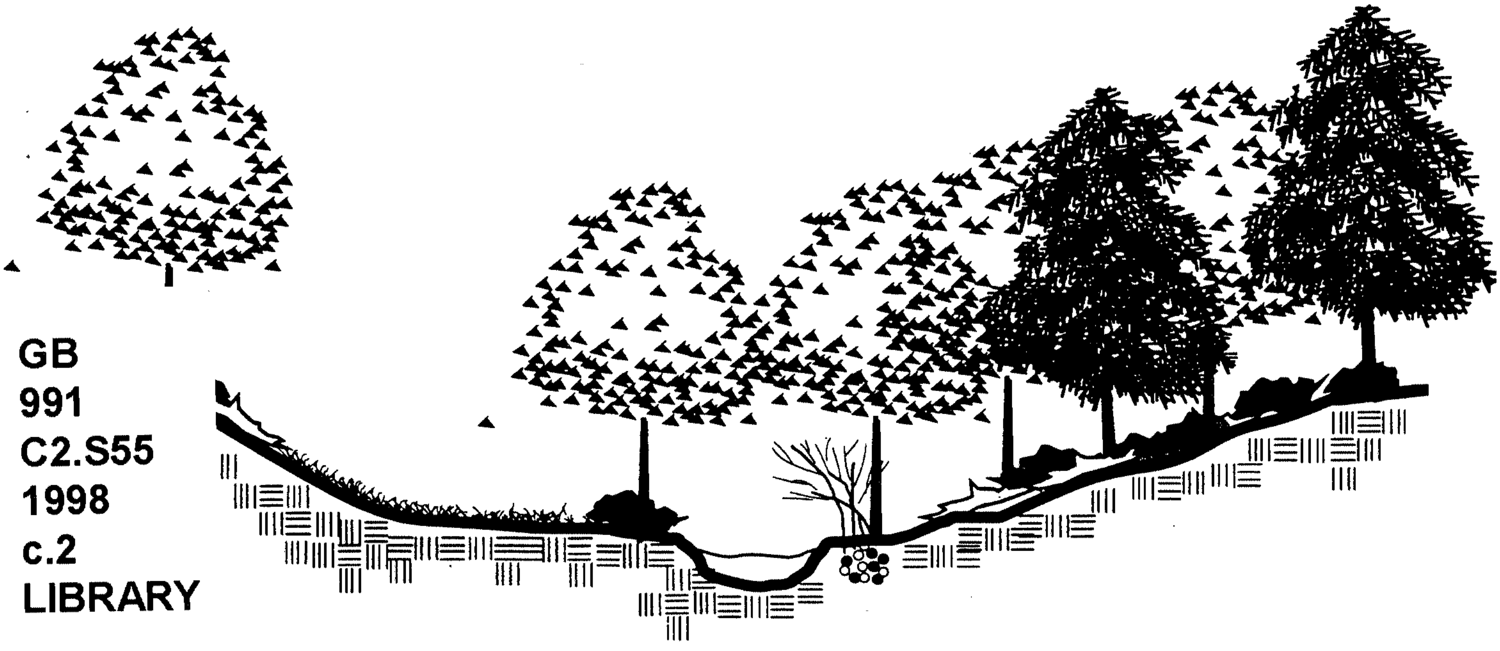
Lower Silver Creek Watershed Project

Santa Clara County, California

Section 404(B)1 Alternatives Analysis & Plan Update

Sponsored by:
Santa Clara Valley Water District
Guadalupe - Coyote Resource Conservation District
USDA/ Natural Resources Conservation Service

December 1998



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SUPPLEMENTAL WATERSHED AGREEMENT NO. 3

LOWER SILVER CREEK WATERSHED, CALIFORNIA

By
Exchange of Correspondence

The original watershed agreement was signed on September 23, 1983. The agreement was modified by exchange of correspondence in supplemental watershed agreement No. 1, signed by all parties in September 1991. It is now necessary to modify the original agreement to reflect revisions to the original watershed work plan.

This amendment to the watershed agreement indicates that all parties involved as sponsors hereby agree to abide by all the revisions to the original work plan as indicated in the attached "Section 404(B) 1 Alternatives Analysis and Plan Update" of December 1998.

A summary of the changes include:

- A reduction in the amount of proposed concrete channel from 3.77 miles to 1.16 miles and the retrofitting of 0.40 miles of existing concrete channel.
- Installing 2.15 miles of vegetated hybrid block channel.
- Increasing the amount of earth channel from 0.87 miles to 0.93 miles.
- Increasing the amount of created wetlands and upland wildlife habitat.
- Installing urban fishery improvements and a fish ladder at the Quimby Road drop structure.

All other terms, conditions and stipulations of the watershed agreement not modified herein remain the same and are agreed to.

____ Date: ___________
President
Guadalupe – Coyote Resource Conservation District

____ Date: ___________
Chairman / Board of Directors
Santa Clara Valley Water District

____ Date: ___________
State Conservationist
USDA/ Natural Resources Conservation Service

GB991C2S55 1998 c.2

LOWER SILVER CREEK WATERSHED PLAN UPDATE

Section 404(B) 1, Alternatives Analysis and Plan Update

Santa Clara County, California

Sponsored By:

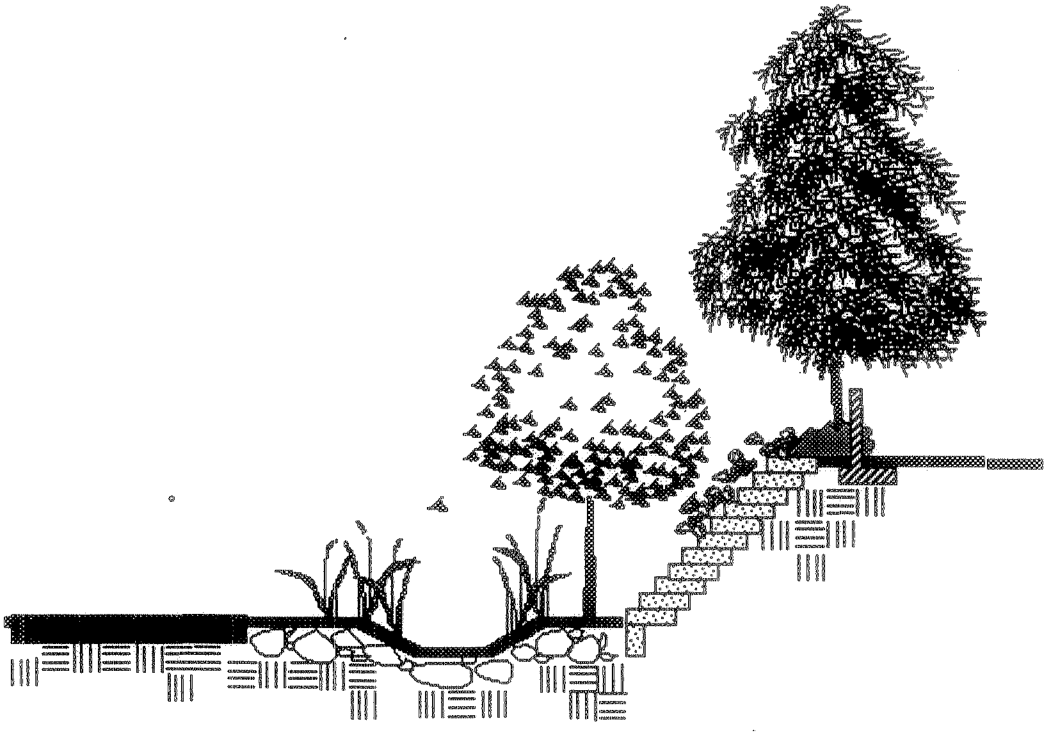
Santa Clara Valley Water District
Guadalupe - Coyote Resource Conservation District
U.S. Department of Agriculture /
Natural Resources Conservation Service

Prepared By:

U.S. Department of Agriculture /
Natural Resources Conservation Service

Davis, California

December 1998



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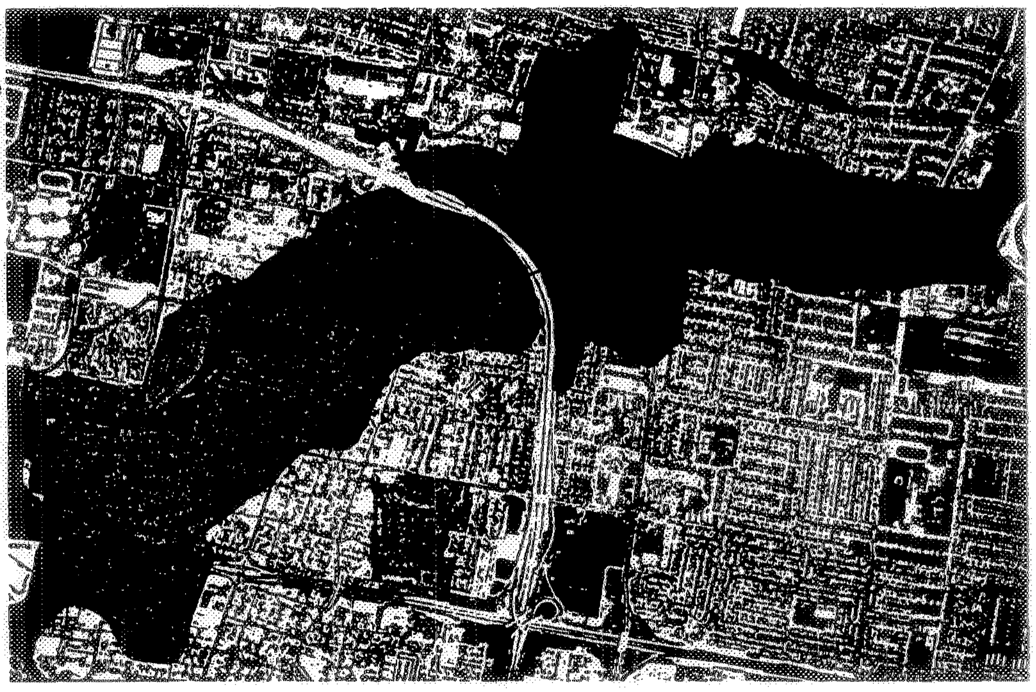
95% of Lower Silver Creek's floodplain has been developed.

100 Year Floodplain of Lower Silver Creek shown in blue

500 Year Floodplain shown by black line



Section 404 (B) 1 Alternatives Analysis

Abstract

This 1998 Alternatives Analysis (Section 404(B)1 and Watershed Plan updates the analysis and recommended plan proposed in the July 1983, Lower Silver Creek Watershed, Final Watershed Plan and Environmental Impact Statement/Report.

In the original 1983 plan, the USDA/ Natural Resources Conservation Service (formally the Soil Conservation Service) investigated five non-structural measures and three structural measures. Three Alternatives were proposed:

- Alternative #1 - No Project
- Alternative #2 - Non-structural Floodplain Protection
- Alternative #3 - Channel Enlargement and Floodproofing

Alternative #3, Channel Enlargement and Floodproofing was selected as the 1983 Recommended (NED) Plan. **See Appendix A.**

Authority

The original 1983 watershed plan was prepared under the authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended (16 USC 1001-1008) and in accordance with section 102(2)(C) of the National Environmental Policy Act of 1969, Public Law 91-190, as amended (42 USC 4321 et seq). The lead agency is the USDA/ Natural Resources Conservation Service (NRCS) (formally the Soil Conservation Service) (SCS), with local sponsors the Santa Clara Valley Water District (SCVWD) and the Guadalupe - Coyote Resource Conservation District (GCRCD) (formally the Evergreen Resource Conservation District). The Final Watershed Plan and Environmental Impact Statement/Report was approved by the lead agency and the sponsors in September 1983.

History

The application by the Santa Clara Valley Water District for a U.S. Army Corps of Engineers 404 permit was made in June 1989. The Corps public notice requesting comments was issued in March 1991. Beginning April 5, 1991 objections to the project were received from various state and federal agencies. The Corps instructed the sponsors to resolve the concerns and re-submit the application. A summary of the responses is located in **Appendix E.**

New Alternatives Analysis

A new design team consisting of sponsors and other interested parties investigated new alternatives in order to reduce the amount of concrete channel proposed and incorporate more environmental design and mitigation elements. Design team meetings and design charettes have enabled interested parties to participate in this redesign and overcome agency objections. The list of design team members is in **Appendix H.**

Eleven additional non-structural and structural measures were analysed. Three new alternatives were further studied and refined:

- Alternative #4 - Geomorphic Stream Restoration with Detention Basins.
- Alternative #5 - Geomorphic Stream Restoration with Diversion Channels.
- Alternative #6 - Hybrid Vegetated Block Wall Channel.

Alternative #6 -The Vegetated Hybrid Channel is the 1998 recommended plan.

1998 Authority

This 1998 Alternatives Analysis and Watershed Plan Update has been prepared under the same authority of the original 1983 watershed plan by an NRCS led design team for the purpose of reducing the amount of concrete channel proposed in the 1983 plan. The recommended plan fully mitigates wetland and riparian acreage and mitigates for fishery resources while maintaining the 1 % chance event (100 year) flood damage reduction requested by the residents of San Jose.

Table 1, summarizes the alternatives. **Appendix B** describes the alternatives we investigated in detail.

Table-1, Lower Silver Creek Alternatives Analysis

	MEASURES :1983 PLAN	DESCRIPTION	ACTION	(1) COST	(2) B/C
	Non-Structural Measures				
A)	Rezoning of Floodplain	Rezoning to prevent development in the floodplain	Rejected - Floodplain already 95% developed		
B)	Acquisition of Vacant Parcels	Purchase of vacant parcels	Rejected - Not enough vacant land available		
C)	Relocation of Homes	Relocation of homes	Economical in some cases, incorporated into Alt 2		
D)	Flood Proofing	Protecting commercial properties, and elevating residences.	Economical, incorporated into Alt 2 &3		
E)	Flood Warning	Allows occupants needed time to install portable flood shields.	Economical component of Floodproofing		
	Structural Measures				
F)	Floodwater Retarding Structures (Dams)	Floodwater retarding structures.	Rejected - Not Economically Feasible		
G)	Off Channel Floodwater Retarding Structure, (Evergreen Lake)	Off channel Floodwater Retarding Structure diverting floods to reservoir.	Rejected - Not Economically Feasible	36,077,076	0.8
H)	Enlargement of Lake Cunningham	Enlargement of the reservoir area or deepening of the reservoir invert.	Rejected - Not Economically Feasible, Objections	37,302,179	
	MEASURES: 1998 PLAN	DESCRIPTION	ACTION	(1) COST	(2) B/C
I)	Decrease Level of Flood Protection	Lower level of flood protection to allow decrease in channel capacity.	Rejected - Sponsor insist on 100 year protection		
J)	Allowing Erosion to Increase Channel Capacity	Widening the stream channel via erosion for greater flow capacity.	Rejected - Severe Slope Failures contribute large sediment loads to Coyote Creek		
K)	Enlarging the Earth Channel	Enlarge and stabilize existing channel within present right-of-way	Selected and Incorporated into Alternatives		
L)	Ideally Restored Creek	Construct a two-stage earth channel with vegetation in right-of-way.	Incorporated into Alternatives Analysis		
M)	Increase Floodwater Storage at Lake Cunningham	Increase floodwater storage at Lake Cunningham - 4 variations.			
		1. Lower the basin invert.	Rejected - Not Economically Feasible	108,675,000	
		2. Increase the surface area of the lake.	Rejected - Not Economically Feasible	55,545,000	
		3. Raising the water surface to elevation 150.	Rejected - Not Economically Feasible	69,460,000	
		4. Raising the water surface to elevation 155.	Rejected - Not Economically Feasible	36,800,000	
N)	Upper Watershed Flood Detention Structures	Provide additional flood detention structures in the upper watershed.	Rejected - Not Economically Feasible	147,638,380	
O)	Lower Watershed Flood Detention Structures	Provide add. flood detention structures in the lower urban watershed.	Rejected - Not Economically Feasible		
P)	Diversion Structures for Floodwater	Diversions from Lower Silver to Coyote Creek via different canals.	Rejected - Not Economically Feasible		
Q)	Soil Bioengineering Measures	Reduce erosion and stabilize banks using log cribwalls.	Rejected - Not Economically Feasible	73,600,000	
R)	Floodproofing (restudy)	Flood walls, house elevation, relocation of homes, and warning system.	Rejected - High Remaining Annual Damages		
S)	Geomorphic Stream Restoration	Recreate historic floodplain by purchasing residential and commercial property. Bridge replacement costs not included.	Rejected - Not Economically Feasible, strong opposition to house removal	220,000,000	
	PLAN ALTERNATIVES	DESCRIPTION	ACTION	(1) COST	(2) B/C
	Alternatives (1983 plan)				
# 1	Alternative #1, No Project	No flood control project implemented	Rejected - Failed to provide adequate protection		
# 2	Alternative #2, Nonstructural Floodplain Protection	Relocation, Floodproofing and Flood Warning	Rejected - Not Economically Feasible	3,461,500	1.9
# 3	Alternative #3, Channel Enlargement and Floodproofing	Earth and Concrete Channelization, Floodproofing 2 Buildings	Selected as the 1983 Recommended (NED) Plan	20,459,218	1.2
	Alternatives (1998 analysis)				
# 4	Alternative #4, Restore Creek w/ Basins	Widen and restore riparian corridor with upper watershed basins.	Rejected - Not Economically Feasible	157,550,000	
# 5	Alternative #5, Restore Cr. w/ Diversions	Widen and restore riparian corridor with a diversion channel.	Rejected - Coyote lacks adequate capacity	27,830,000	
# 6	Alternative #6, Hybrid Channels	Excavate/Construct earth, concrete, and hybrid block channels.	**Selected as the Recommended 1998 Plan**	**29,491,275**	**1.04**

1. Cost is in 1998 dollars

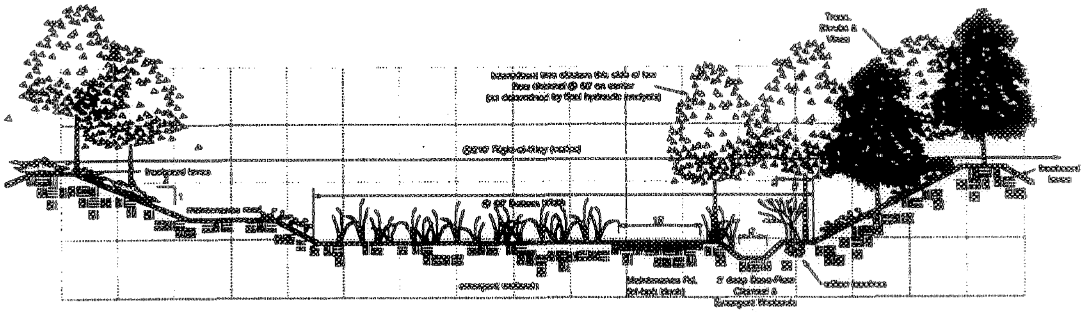
2. B/C = Benefits to Cost Ratio

1998 Recommended Plan

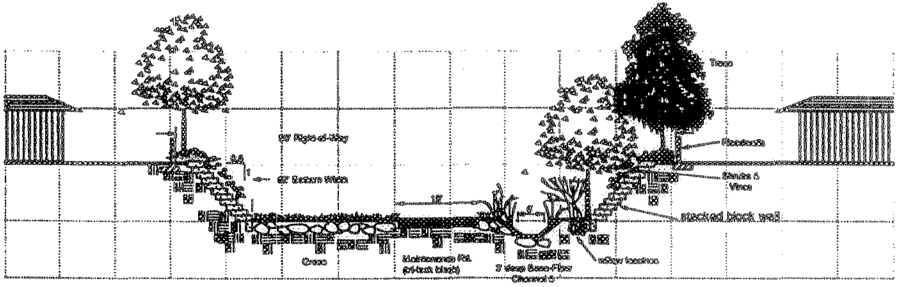
Summary:

The following illustrates the proposed plan to provide 100 year flood damage reduction and mitigate for wetland, riparian and fishery habitat. The 3.77 miles of concrete and 0.87 miles of earth channel proposed in the '83 plan have been revised to:

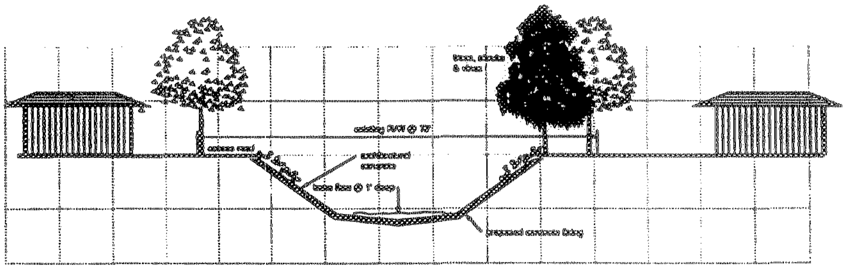
- **0.93 miles of multi-stage vegetated earth channel:**



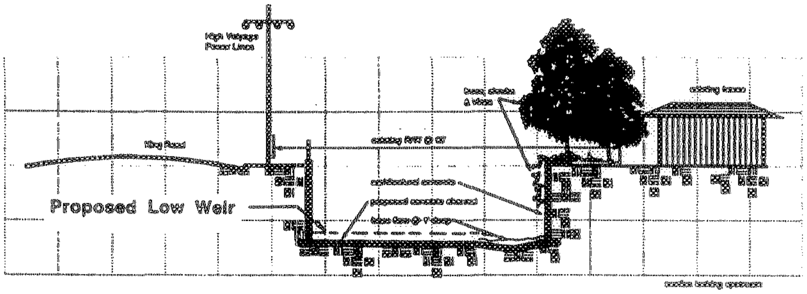
- **2.15 miles of vegetated hybrid block wall channel with earth or earth covered riprap bottom:**



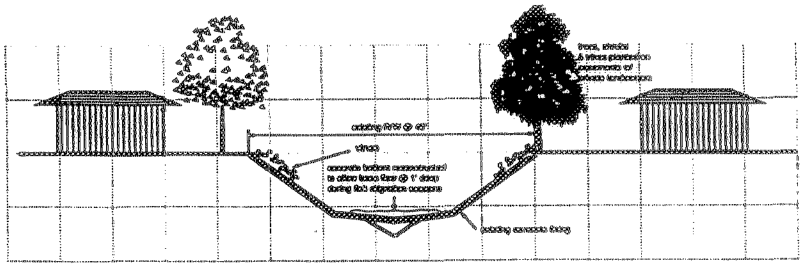
- **0.57 miles of new trapezoidal concrete channel:**



- **0.25 miles of new rectangular concrete channel:**



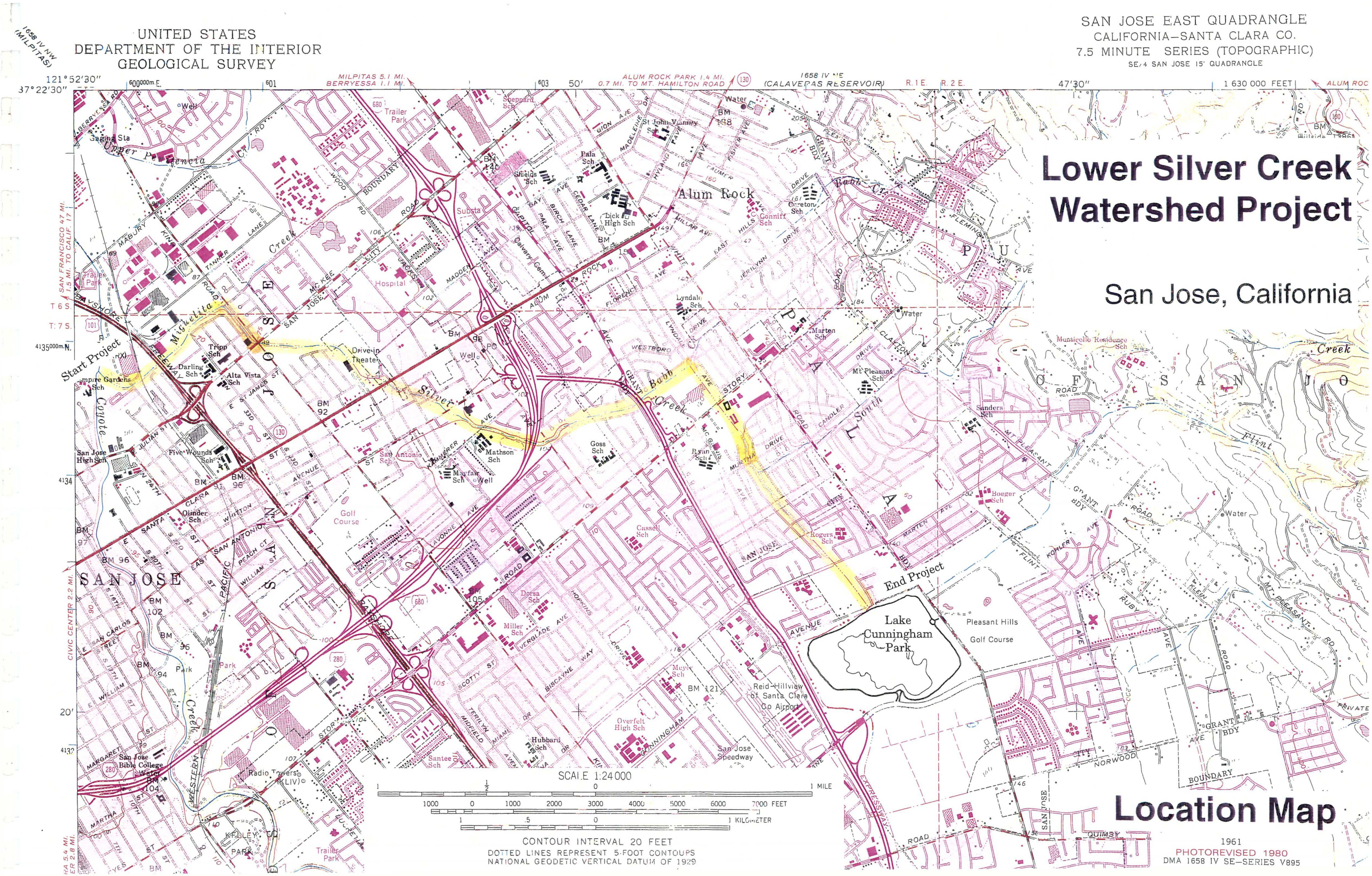
- **Retrofitting 0.40 miles of existing rectangular concrete channel with a low flow channel and resting pools:**



- **0.34 miles of existing highway bridges/ culverts to remain.**

Lower Silver Creek Watershed Project

San Jose, California


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
SAN JOSE EAST QUADRANGLE
CALIFORNIA—SANTA CLARA CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SE/4 SAN JOSE 15' QUADRANGLE
1658 IV NW (MILPITAS)
Start Project
End Project
Silver Creek
Miguelita Creek
Babb Creek
Coyote Creek
Lake Cunningham Park
Pleasant Hills Golf Course
Reid-Hillview of Santa Clara Co Airport
Alum Rock
SAN JOSE
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 5-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
1961
PHOTOREVISED 1980
DMA 1658 IV SE—SERIES V895

Location Map

Summary of the 1998 Recommended Plan:

- A reduction in the amount of proposed concrete channel from 3.77 miles to 1.16 miles and the retrofitting of 0.40 miles of existing concrete channel; Installing 2.15 miles of vegetated hybrid block channel; Increasing the amount of earth channel from 0.87 miles to 0.93 miles; Increasing the amount of created wetlands and upland wildlife habitat; Installing urban fishery improvements and a fish ladder at the Quimby Road drop structure. Approximately 148,000 cubic yards of earth will be excavated. Maintenance roads will be mostly located in channel bottoms.

- The original watershed hydrology was verified by comparing it to other studies performed by US Army Corps of Engineers, US Geological Survey and Santa Clara Valley Water Districts. The verified Q_{100} = 5,630 cfs and Q_2 = 1,340 cfs.

- Fishery mitigation and enhancement is now incorporated into the 1998 plan: Low flow channels will be continuous from Coyote Creek to Lake Cunningham. Riparian vegetation will be planted to shade low flow channels. The single 5.1 foot drop structure proposed in the "83 plan has been eliminated. Two structures, one 2.5 feet high and the other 2.0 feet high will replace it. Both will incorporate low flow notches and resting pools. Additional pools and riffles will be installed in the channel invert. The Guadalupe - Coyote Resource Conservation District (GCRCD) will initiate fishery operation, maintenance and citizen monitoring programs. Santa Clara Valley Water District will install fish ladders on the existing Quimby Road drop structure.

- A new jurisdictional wetland delineation was performed. 8.8 acres of jurisdictional wetlands and waters of the United States were identified within the project area, 4.7 acres are wetlands and 4.1 acres are open water. See companion report *"Identification of Waters of the U.S. - Jurisdictional Delineation, Lower Silver Creek Watershed Project"*.

- A vegetation survey indicated that 2.0 acres of existing upland shrubs and other plants growing within the channel right-of-way are to be impacted.

- A mitigation plan has been prepared that illustrates proposed riparian, wetland and fishery mitigation measures to be installed concurrantly with channel construction. A fishery enhancement plan has also been prepared. The '98 plan will replant 22.2 acres of native trees and shrubs providing a continuous riparian and/or upland corridor from Coyote Creek to Lake Cunningham. The mitigation plan proposes a net increase of wetland and other riparian habitat functions and values. The replacement ratio is approximately 1.3 acres replaced to 1 acre removed for wetlands and approximately 5.4 acres replaced to 1 acre one for riparian and upland habitat. The target acreages are 6.1 acres of wetlands, 4.4 acres of open water (summer flow)and 22.2 acres of riparian and upland habitat. See companion Report *"Mitigation and Monitoring Program for Lower Silver Creek"*.

- Mitigation monitoring will occur jointly by the Natural Resources Conservation Service, the Guadalupe - Coyote Resource Conservation District and the Santa Clara Valley Water District for the first ten years after completion of each phase of the project.

- Best Management Practices will continue to be implemented by sponsors and the County of Santa Clara for non-point source pollution control and upper watershed management.

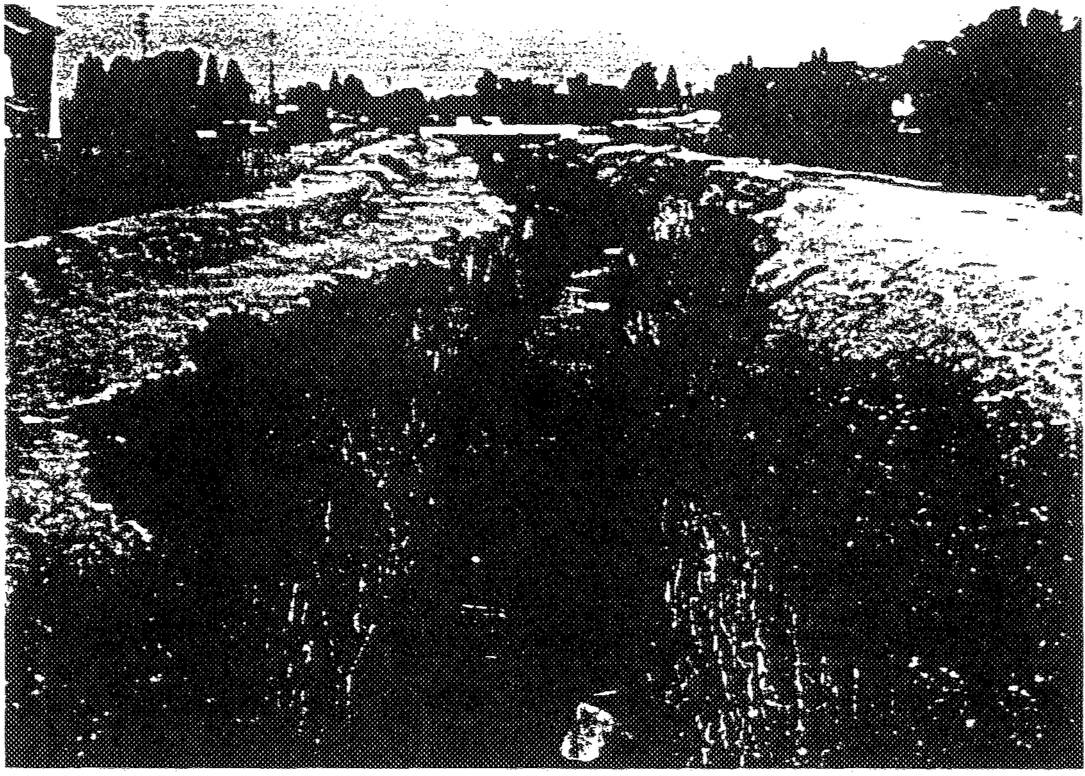
- The updated project cost is $29.5 million ('98 dollars) with a benefit cost ratio of 1.04.

Summary of the 1998 Recommended Plan:

Lower Silver Creek: **Reach 6b**

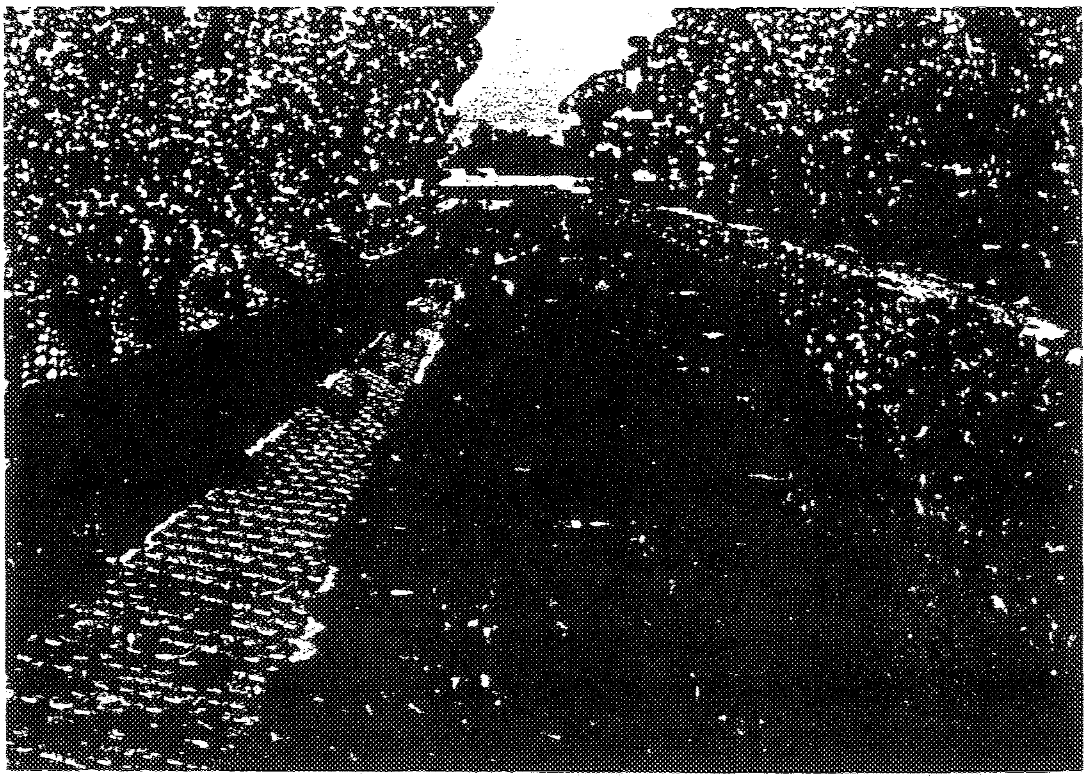
Existing View:

Looking downstream from Cunningham Ave.



Proposed Construction:

Computer simulation of hybrid block walls, low flow channel and planted riparian habitat. Maintenance road on flexible block pavers in invert, low flow shaded by riparian vegetation. Emergent wetlands along sides of low flow channel. Resting pools and riffles installed in low flow channel.



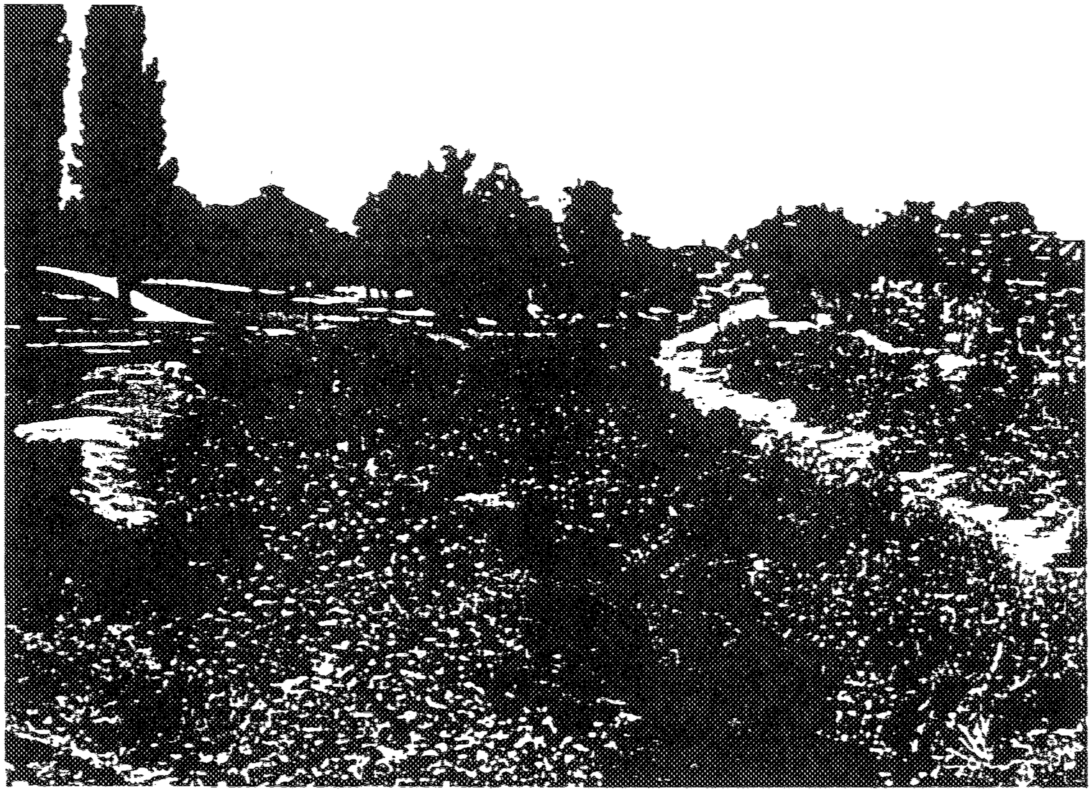
Summary of the 1998 Recommended Plan:

Lower Silver Creek: **Reach 3e**

See **Drawings** for additional simulations.

Existing View:

Looking downstream along Mayfair Park, from Kammerer Ave.

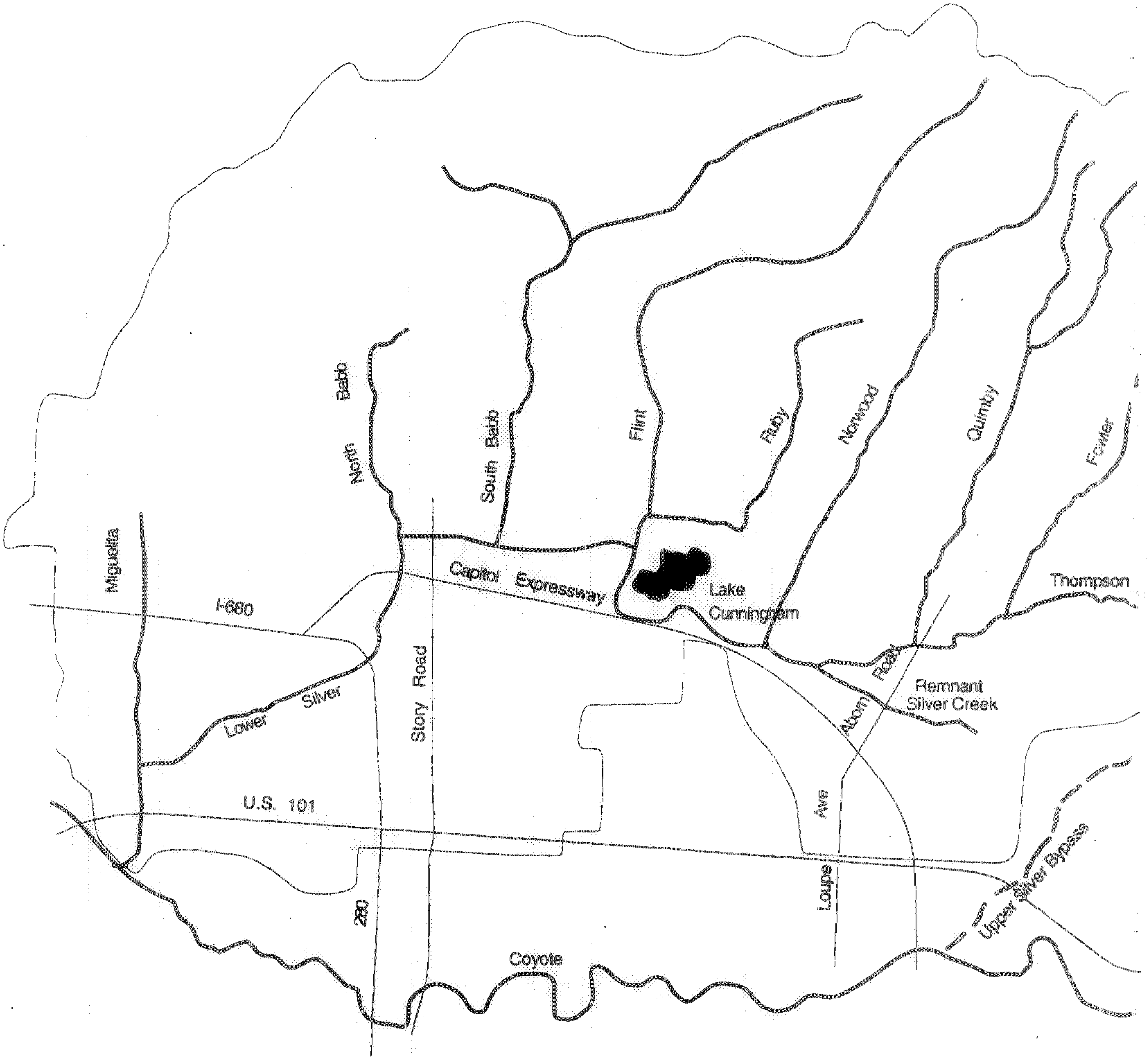


Proposed Construction:

Computer simulation of earth channel with riparian vegetation planted along banks and along invert. Grass along channel bottom. Emergent wetlands along sides of low flow channel.

Figure 1.

General Watershed Map



USDA
Soil Conservation Service
Davis, California

Date: 8/3/93 Drawn by: L. Lundin

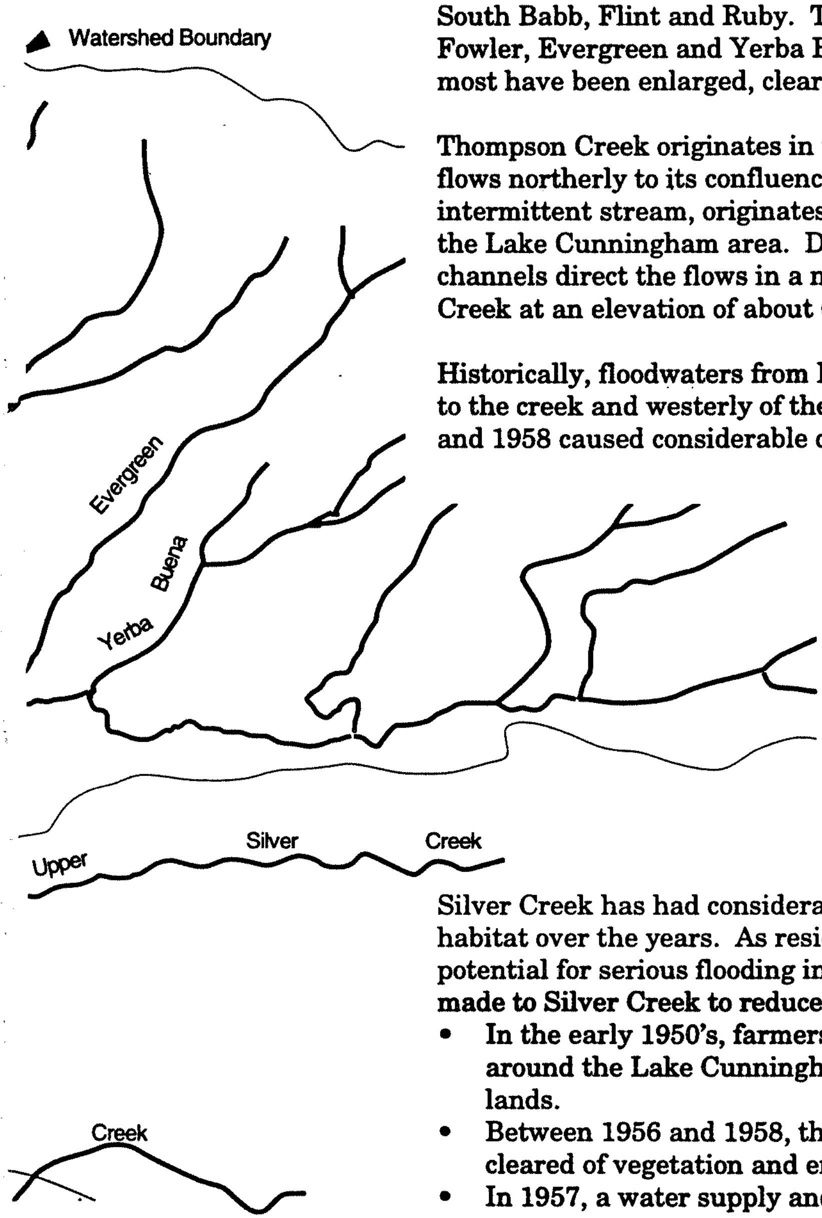
The Saga of Silver Creek

The Lower Silver Creek Watershed covers an area of approximately 43 square miles, (including the Thompson Creek subwatershed of about 21 square miles). Both creeks are located in the eastern portion of the City of San Jose and in the unincorporated area of the County of Santa Clara.

The Lower Silver Creek watershed includes many tributaries: Miguelita, North Babb, South Babb, Flint and Ruby. Thompson Creek's tributaries are Norwood, Quimby, Fowler, Evergreen and Yerba Buena Creeks. All these streams are intermittent and most have been enlarged, cleared or piped as they enter the valley floor.

Thompson Creek originates in the Diablo Range foothills at elevation 2,300 ft. and flows northerly to its confluence with Lower Silver Creek. Lower Silver Creek, also an intermittent stream, originates at an elevation of about 180 ft. and flows northerly to the Lake Cunningham area. Downstream of Lake Cunningham, earthen and concrete channels direct the flows in a northwesterly direction to its confluence with Coyote Creek at an elevation of about 60 ft.

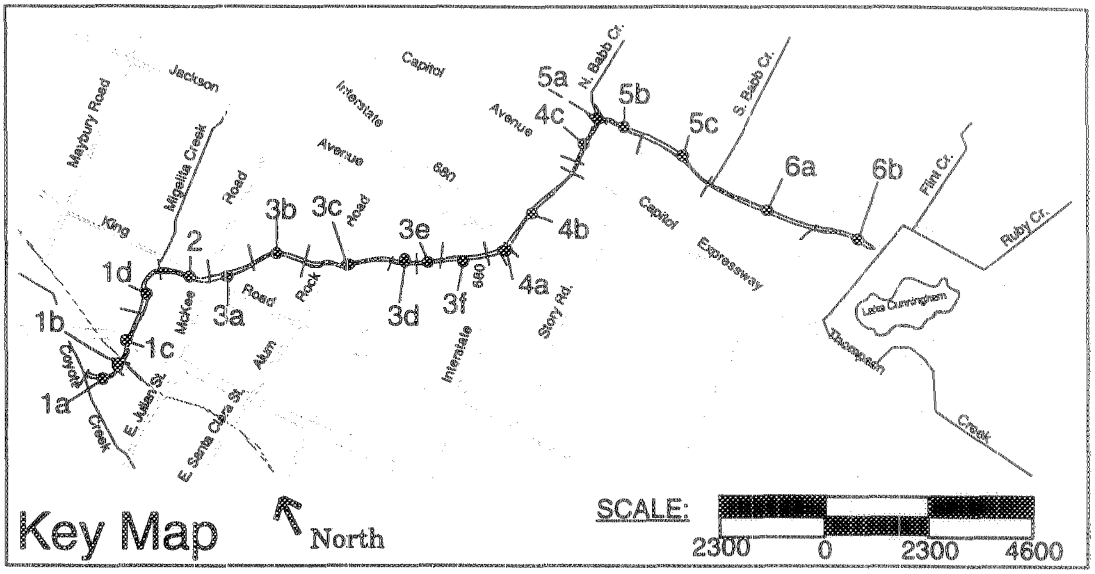
Historically, floodwaters from Lower Silver Creek have inundated the areas adjacent to the creek and westerly of the creek to Bayshore Freeway. The floods of 1952, 1955, and 1958 caused considerable damage to homes and businesses built on the floodplain.



Silver Creek has had considerable changes to its configuration, alignment and wildlife habitat over the years. As residential and commercial development occurred, the potential for serious flooding increased. The following is a summary of the changes made to Silver Creek to reduce flooding:

- In the early 1950's, farmers diverted Lower Silver Creek into an earth channel around the Lake Cunningham and North Babb areas to improve agricultural lands.
- Between 1956 and 1958, the channel between Coyote Creek and Capitol Ave. was cleared of vegetation and enlarged.
- In 1957, a water supply and flood control dam was proposed on Upper Silver Creek at Silver Creek road and the Evergreen Canal. However, the Upper Silver Creek Bypass alternative was favored over the 37,000 AF dam.
- In the 1970's, the bypass was constructed diverting flows from the Upper Silver Creek watershed to Coyote Creek. The channel between Capitol Expressway and King Road, upstream of Lake Cunningham, was realigned and enlarged. Thompson Creek was enlarged from Lower Silver through Quimby Road.
- In 1976, the channel between Capitol Expressway and Cunningham Avenue was further cleared and enlarged.
- In 1978, construction of Lake Cunningham began. Setback levees were installed along Thompson Creek from Quimby Road to Cadwallader Ave.
- In 1980, the SCVWD and the GCRCD requested that the NRCS assist in further reducing potential flood damages by preparing a watershed workplan.

Summary of the 1998 Recommended Plan:

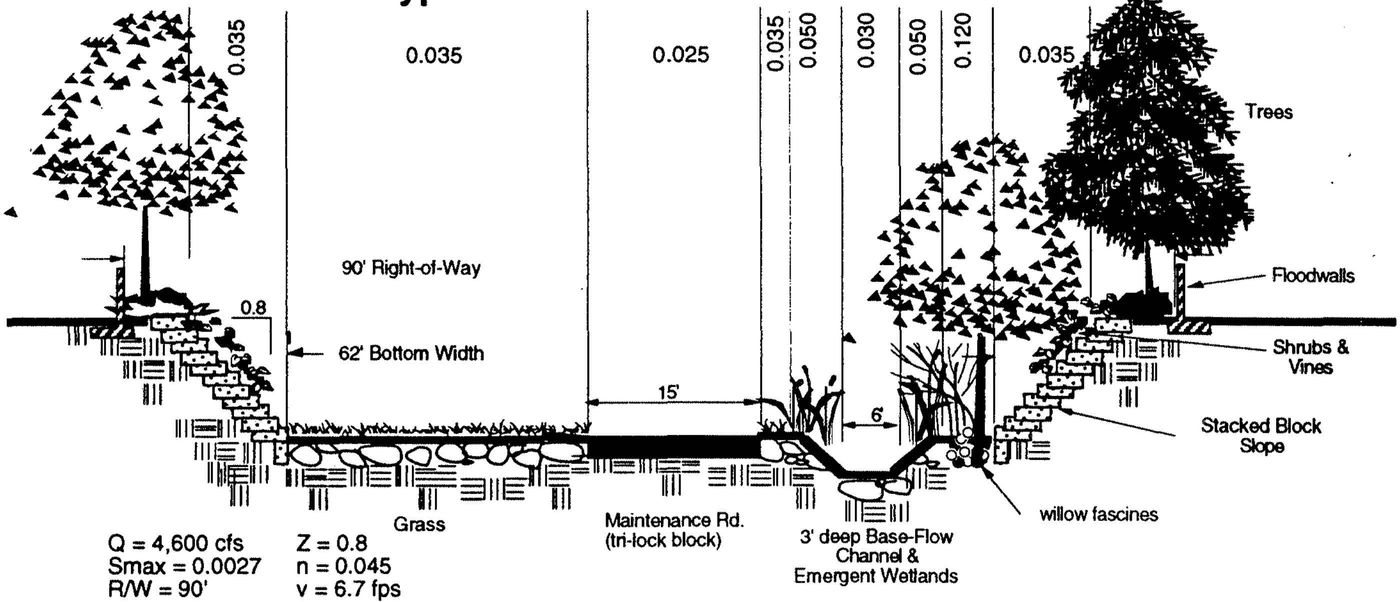


Reach	Proposed Channel Type	Approx. Length
1a	Earth	770'
1b	Hybrid Concrete Block w/ Topsoil over Riprap	530'
1c	Trapazoidal concrete	1400'
1d	Earth w/ floodwalls	985'
2	Rectangular concrete	1315'
3a	Earth	1600'
3b	Trapazoidal concrete	975'
3c	*(Low flow retrofit of existing trapazoidal channel)*	*2095'*
3d	Trapazoidal concrete	655'
3e	Earth	655'
3f	Earth	900'
4a	Hybrid Concrete Block w/ Topsoil over Riprap	220'
4b	Hybrid Concrete Block w/ Topsoil over Riprap	2300'
4c	Hybrid Concrete Block w/ Topsoil over Riprap	1300'
5a	" " w/ Transition structure	240'
5b	Hybrid Concrete Block w/ Topsoil over Riprap	860'
5c	Hybrid Concrete Block w/ Topsoil over Riprap	1830'
6a	Hybrid Concrete Block w/ Topsoil over Riprap	1480'
6b	Hybrid concrete block w/ earth bottom	2540'
	(Existing highway bridge / culverts to remain)	*1800'*

Summary of the 1998 Recommended Plan:

Hybrid Block Channel Section

Typical "n" Value Subsections

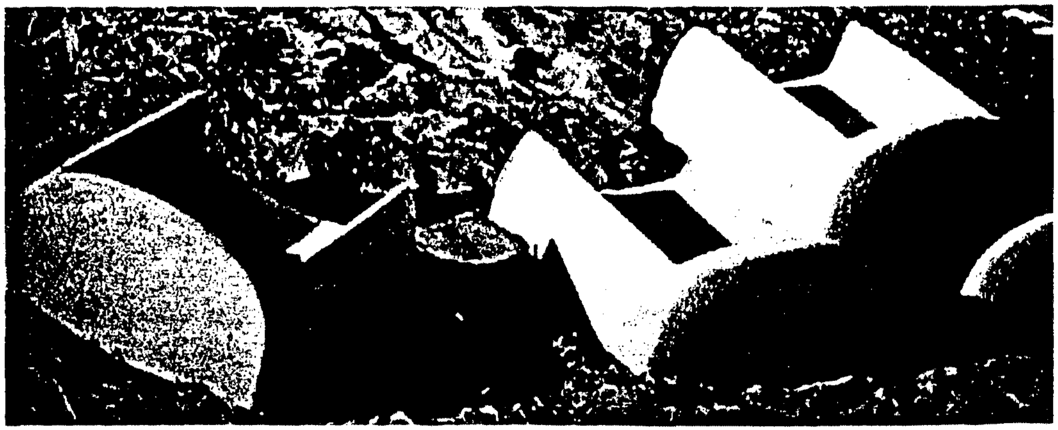


Q = 4,600 cfs
Smax = 0.0027
R/W = 90'
TOB = 11.0'
B = 62'

Z = 0.8
n = 0.045
v = 6.7 fps
Depth = 9.9'
Depth w/ Freeboard = 11.9'
Floodwalls L = 450'

The above illustrates a typical section through the proposed hybrid block channel. Capacity is increased over the existing earth channel by excavating to the existing right-of-way, locating the maintenance road in the bottom and constructing a concrete block wall to protect the banks from erosive flows. The blocks are planted with native shrubs and vines. Preliminary soil mechanics investigations suggest that the soils present along Lower Silver Creek should not need filter fabric behind the blocks to prevent washout. Detailed engineering analysis to determine wall batter and behavior in saturated soils or other stochastic events will be performed during final design. A low flow channel is constructed on the south side of the channel invert and planted with native trees and shrubs to provide shade. In many reaches, floodwalls will be constructed to provide freeboard. Composite "n" values were developed based on typical roughness factors of individual subsections. Some reaches can support a greater number of trees in the invert than others. All reaches will have trees planted on top of the banks.

Loffelstein Blocks or comparible are stacked and filled with soil to protect slopes. The blocks will be planted with native grasses, shrubs and vines.



The invert of the channel will be lined in approximately half the reaches to protect the bottom from the higher velocities. The riprap voids will be filled with topsoil to support native grasses. Incidental erosion and maintenance removal of vegetation from the channel invert will be replaced during the operation and maintenance of the channel.

The maintenance road will be constructed from interlocking concrete blocks filled with earth. Concrete lined ramps will be located at most road crossings. Modifications are proposed to the existing concrete culverts and the existing concrete channel along Reach 3c to insure 1' deep low flows.

The 1998 Recommended Plan: Reach by Reach

Drawings 1 through 23 illustrate proposed channel configurations of the 1998 Recommended Plan. Sections and plan views are included as well as computer simulations of the proposed construction. A reach by reach summary follows:

Reach 1a:
770 lf. of two stage earth channel, 65' bottom width and 210' R/W. A 3' deep low flow channel with native riparian trees and shrubs planted for shade. Bio-engineering techniques for slope stabilization and habitat value. Dual 2' and 2.5' high grade control structures with low flow notches and resting pools incorporated. Invert 6" to 12" above water table to support emergent marsh. Maintenance road in invert to be interlocking concrete pavers to support rubber tire maintenance vehicles. Low earth levees constructed for freeboard. Approximately 14,400 CY of earth would be excavated.

Reach 1b:
530 lf. of hybrid vegetated block wall channel w/ earth covered riprap invert. Bands of emergent marsh vegetation along low flow. Grass in bottom. Riparian trees and shrubs planted along low flow and on top of both banks. Rock vortex weirs to concentrate low flow and aerate water. New bridge to be built at Wooster Ave. 4' high floodwalls required for freeboard. Approximately 5,000 CY of earth would be excavated.

Reach 1c:
1,400 lf. of architecturally treated trapezoidal concrete channel due to tight 110' R/W. Low flows concentrated in center, 1' deep min. Resting pools 3' deep. Native trees, shrubs and vines planted along top of bank. Approximately 21,660 CY of earth would be excavated.

Sponsors presently investigating additional land acquisition to increase R/W. Investigating long-span WPRR bridge replacements instead of present bridge. Estimated additional non-federal costs are $750,000 for WPRR and $475,000 for additional R/W. Additional federal costs for Hybrid Channel in lieu of concrete $175,000.

Reach 1d:
985 lf. two stage earth channel w/ 4' high floodwalls and earth levee for freeboard. 75' bottom width and 177' R/W. Riparian species for shade and habitat. Emergent wetland vegetation and maintenance access in channel bottom. Approximately 25,925 CY of earth would be excavated.

Reach 2:
1,315 lf. of architecturally treated rectangular concrete channel due to very tight 65' R/W. Intermittant low wiers with notches to pool water and trap sediment allowing temporary emergent marsh and meandering low flow to occur (not counted in mitigation acerages). Sediment periodically removed. Native trees and vines to shade low flow. Approximately 9,300 CY of earth would be excavated.

The 1998 Recommended Plan: Reach by Reach (continued)

Reach 3a:
1,600 lf. earth channel w/ 50' bottom width and 130' R/W. Intermittent tree clusters @ 50' on center along low flow. Bands of emergent marsh vegetation along low flow. Grass in invert. Earth levee for freeboard on residential side, overland flow and park access on other. Resting pool to be located away from public access. Riparian trees and shrubs planted on south bank. Rock vortex weirs to concentrate low flow and aerate water. Approximately 11,800 CY of earth would be excavated.

Reach 3b:
975 lf. architecturally treated trapezoidal concrete channel due to very tight 70' R/W. Low flows and resting pools incorporated. Native trees, shrubs and vines planted along top of banks. Approximately 5,300 CY of earth would be excavated.

Reach 3c:
2,095 lf. existing trapezoidal concrete channel in very narrow 45' R/W. Low flow channels and resting pools to be saw cut in existing concrete. Native trees, shrubs and vines planted along easements with private landowners. No excavation in this reach.

Reach 3d:
655 lf. architecturally treated trapezoidal concrete channel due to very tight 75' R/W. Low flows and resting pools incorporated. Native trees, shrubs and vines planted along top of banks. Approximately 3,600 CY of earth would be excavated.

Reach 3e:
665 lf. earth channel w/ 60' bottom width and 130' R/W. Intermittent tree clusters @ 50' on center along low flow. Bands of emergent marsh vegetation along low flow. Grass in earth bottom. Earth levee for freeboard on residential side, overland flow and park access on other. Resting pool to be located away from public access to limit predation. Riparian trees and shrubs planted on south bank. Rock vortex weirs to concentrate low flow and aerate water. Kammerer Ave. bridge to be replaced w/ pedestrian bridge. Approximately 4,900 CY of earth would be excavated.

Reach 3f:
900 lf. earth channel w/ 75' bottom width and 170' R/W. Additional R/W purchased from school. Running track relocation at sponsors cost. Intermittent tree clusters @ 50' on center along low flow. Bands of emergent marsh vegetation along low flow. Grass in earth bottom. Environmental classroom access on south bank. Resting pool to be located away from public access. Riparian forest planted on south bank. Rock vortex weirs to concentrate low flow and aerate water. Approximately 23,000 CY of earth would be excavated.

Reach 4a:
220 lf. of hybrid vegetated block wall channel w/ earth covered riprap invert. Existing concrete channel to be removed. Bands of emergent marsh vegetation along low flow. Grass in bottom. Riparian trees and shrubs planted along low flow and on top of both banks. Rock vortex weirs to concentrate low flow and aerate water. New bridge to be built for Jackson Ave. 4' high floodwalls required for freeboard. Approximately 1,700 CY of earth would be excavated.

Reach 4 b:
2,300 lf. of hybrid vegetated block wall channel w/ earth covered riprap invert. Bands of emergent marsh vegetation along low flow. Grass in bottom. Riparian trees and shrubs planted along low flow and on top of both banks. Rock vortex weirs to concentrate low flow and aerate water. 4' high floodwalls required for freeboard. Low flow and resting pools incorporated in channel bottom. Approximately 8,800 CY of earth would be excavated.

The 1998 Recommended Plan: Reach by Reach (continued)

Reach 4c:
1,300 lf. of hybrid vegetated block wall channel w/ earth covered riprap invert. 34' bottom width and 65' R/W. Bands of emergent marsh vegetation along low flow. Maintenance access in bottom. Riparian trees and shrubs planted along low flow and on top of both banks. Rock vortex weirs to concentrate low flow and aerate water. 4' high floodwalls required for freeboard. No net excavation in this reach. Cut and fill is estimated to balance out.

Reach 5a:
240 lf. of hybrid vegetated block wall channel w/ earth covered riprap invert. North Babb Creek transition structure. No net excavation in this reach. Cut and fill is estimated to balance out.

Reach 5b:
860 lf. of hybrid vegetated block wall channel w/ earth covered riprap invert. 37' bottom width and 65' R/W. Bands of emergent marsh vegetation along low flow. Maintenance access in bottom. Riparian trees and shrubs planted along low flow and on top of both banks. Low flow located along toe of south bank to maximize shade from trees on top of banks. Rock vortex weirs to concentrate low flow and aerate water. 4' high floodwalls required for freeboard. No net excavation in this reach. Cut and fill is estimated to balance out.

Reach 5c:
1,830 lf. of hybrid vegetated block wall channel w/ earth covered riprap invert. 50' bottom width and 80' R/W. Bands of emergent marsh vegetation along low flow. Maintenance access in bottom. Clusters of riparian trees and shrubs planted along low flow and in bands on top of both banks. Rock vortex weirs to concentrate low flow and aerate water. 4' high floodwalls required for freeboard. No net excavation in this reach. Cut and fill is estimated to balance out.

Reach 6a:
1,480 lf. of hybrid vegetated block wall channel w/ earth covered riprap invert. 50' bottom width and 80' R/W. Bands of emergent marsh vegetation along low flow. Maintenance access in bottom. Clusters of riparian trees and shrubs planted along low flow and in bands on top of both banks. Rock vortex weirs to concentrate low flow and aerate water. 4' high floodwalls required for freeboard. Approximately 2,200 CY of earth would be excavated.

Reach 6b:
2,540 lf. of hybrid vegetated block wall channel w/ earth covered riprap invert. 80' bottom width and 105' R/W. Bands of emergent marsh vegetation along low flow. Maintenance access in bottom. Clusters of riparian trees and shrubs planted along low flow and in bands on top of both banks. Rock vortex weirs to concentrate low flow and aerate water. 4' high floodwalls required for freeboard. Residential development now occupying land shown as vacant on 1988 aerial photograph used as base map. Approximately 10,100 CY of earth would be excavated.

Tentative Construction Schedule

Construction would be accomplished approximately a reach every two years starting with the downstream Reach 1 and proceeding upstream. Federal funding availablity will be the deciding factor. Reach 1 construction is tentatively scheduled for the 1999 construction season.

Threatened and Endangered Species

As required under Section 7(c) of the Endangered Species Act, as amended (Act), the USDI/ Fish and Wildlife Service (USFWS) was requested to review this project and provide a list of existing and proposed endangered and threatened species that may be present in the project area. The USFWS found:

- **One listed species:**
  California Red-legged frog, *Rana aurora draytonii*

- **14 candidate species:**
  Amphibians:
  California tiger salamander, *Ambystoma californiense*
  foothill yellow-legged frog, *Rana boylii*

  Reptiles:
  northwestern pond turtle, *Clemmys marmorata marmorata*
  southwestern pond turtle, *Clemmys marmorata pallida*

  Birds:
  loggerhead shrike, *Lanius ludovicianus*

  Mammals:
  San Francisco dusky-footed woodrat, *Neotoma fuscipes annectens*
  Pacific western big-eared bat, *Plecotus townsendii townsendii*
  greater western mastiff-bat, *Eumops perotis californicus*

  Plants:
  Mt. Hamilton thistle, *Cirsium fontinale var. campylon*
  South Bay clarkia, *Clarkia concinna ssp. automixa*
  northcoast bird's-beak, *Cordylanthus maritimus ssp. palustris*
  Hoover's button-celery, *Eryngium aristulatum var. hooveri*
  Contra Costa goldfields, *Lasthenia conjugens*
  delta tule-pea, *Lathyrus jepsonii var. jepsonii*

A California Red-legged frog survey was performed by the NRCS in the Fall of 1996 and the Spring of 1997 according to the USFWS protocol "*Guidance on Site Assessment and Field Surveys for California Red-legged Frogs*". It was reported to the USFWS that no California Red-legged frogs were identified. Based on the survey, locality records and other information, the USFWS determined that no population or individuals exist at the project site. **See Appendix F.** for USDI/ Fish and Wildlife Service letter and Species listing.

The California Department of Fish and Game Natural Diversity Data Base, Species/ Community Location Summery Report lists 12 species of concern that may inhabit the project area:

Species Name	Federal Status	State Status
Edgewood Blind Harvestman, *Calicina minor*	Cat. 2	none
Mt. Hamilton Thistle, *Cirsium campylon*	Cat. 2	none
Contra Costa Goldfields, *Lasthenia conjugens*	Cat. 1	none
Metcalf Canyon Jewelflower, *Streptanthus albidus ssp. albidus*	Prop. End.	none
Santa Clara Valley Dudleya, *Dudleya setchellii*	Prop. End.	none
California Tiger Salamander, *Ambystoma californiense*	Cat. 2	none
Berkeley Kangaroo Rat, *Dipodomys heermanni berkeleyenis*	none	none
Serpentine Bunchgrass	none	none
Bay Checkerspot Butterfly, *Euphydryas editha bayensis*	Threatened	none
San Francisco Forktail Damselfly, *Ischnura gemina*	Cat. 2	none

The California Wildlife Habitat Relationships System database lists all potential species of terrestrial vertebrates found in the habitat and location of the project site. In the Freshwater Emergent Wetland habitat of Lower Silver Creek, the 1997 database lists 71 species. **See Appendix G.**

See the seperate document "*Biological Assessment for the Lower Silver Creek*" for results of field investigations into presence and impacts of above referenced species and associated habitat by the proposed project.

Mosquito Abatement

It is estimated that with the construction of the uniform low flow channel dimensions and gradient, summer flow velocities should average slightly higher with the recommended plan than the 0.5 to 2 feet per second observed during the summer in the existing channel. The confined flows and increased velocity should reduce mosquito breeding habitat. The proposed resting pools along the low flow channel are designed to be continually flushed.

It is also estimated that the improvement in fish habitat throughout the project site, will allow an increase in the existing populations of mosquito preditors such as the three-spined stickleback and mosquitofish.

Sediment Deposition

With the recommended plan in place, sediment carried by flood waters will no longer be deposited on streets, yards and in buildings on the floodplain. With flooding reduced or eliminated, this sediment will deposit in the stream corridor at locations where flow velocities decrease. Most of it will deposit in the Reach 2 sediment trap and in the downstream earth reaches. A small amount will make it through Coyote Creek and be transported all the way to San Francisco Bay. The amount reaching the bay is estimated to be less than 2/10ths of 1 percent of Coyote Creek's contribution to sediment in the bay and less than 4/100ths of 1 percent of the total sediment yield to the south bay. This impact will occur only during periods of high flow.

Urban Fishery

The 1998 Recommended Plan includes numerous features to mitigate the damages that channel and habitat modification have caused the Lower Silver fishery. We will be taking measures to reverse the decline in the existing urban fishery and reduce Lower Silver Creek's turbidity and water temperature. The existing species diversity is limited primarily to mospuito fish, fathead minnows, goldfish, roach, three-spine stickleback and hitch. A salmon was found in Lower Silver Creek on November 29,1994 by John Shay of the Santa Clara Valley Water District. The dead adult was laying on the downstream concrete apron of the culvert under highway 101. This is the first recorded sighting of a salmon in Lower Silver Creek. (pers. com. J. Shay, SCVWD). See the seperate document *"Biological Assessment for the Lower Silver Creek"* for a listing of species of fish found in the creek.

Proposed Fishery Mitigation Elements:

With the assistance of National Marine Fisheries (NMF), California Department of Fish and Game (CDF&G) and the US Fish and Wildlife Service (USFWS), we have optimized the recommended plan for the needs of steelhead. (pers. com. M. Thabault, NMF). The grade control structure originally proposed in Reach 1a has been revised to two lower structures. One structure will be 2 feet high, the other will be 2 1/2 feet high. Both will have a "V" notch to concentrate low flows. There will also be an intermediate "resting pool" between the structures. Separate from this workplan update, the Santa Clara Valley Water District has agreed to consult with the California Department of Fish and Game and construct a fish ladder at the Thompson Creek drop structure at Quimby Road. **See Computer Simulation - next page.**

The Fishery Mitigation Plan includes:
- Low flow channels for all of the new channel work.
- Vegetated benches
- Resting pools, lunkers and riffles
- Vortex weirs and other in-stream shelters
- Riparian and emergent wetlands
- Pool installation and water bars in existing concrete channels

With the installation of water bars and resting pools in the existing concrete channel Reach 3c, we estimate the low flow depth and velocity to be acceptable for fish migration. According to the NMF, these features should allow steelhead to migrate in Lower Silver Creek during higher than average rainfall years. (pers. com. M. Thabault, NMF).

Proposed Fishery Enhancement Plan:

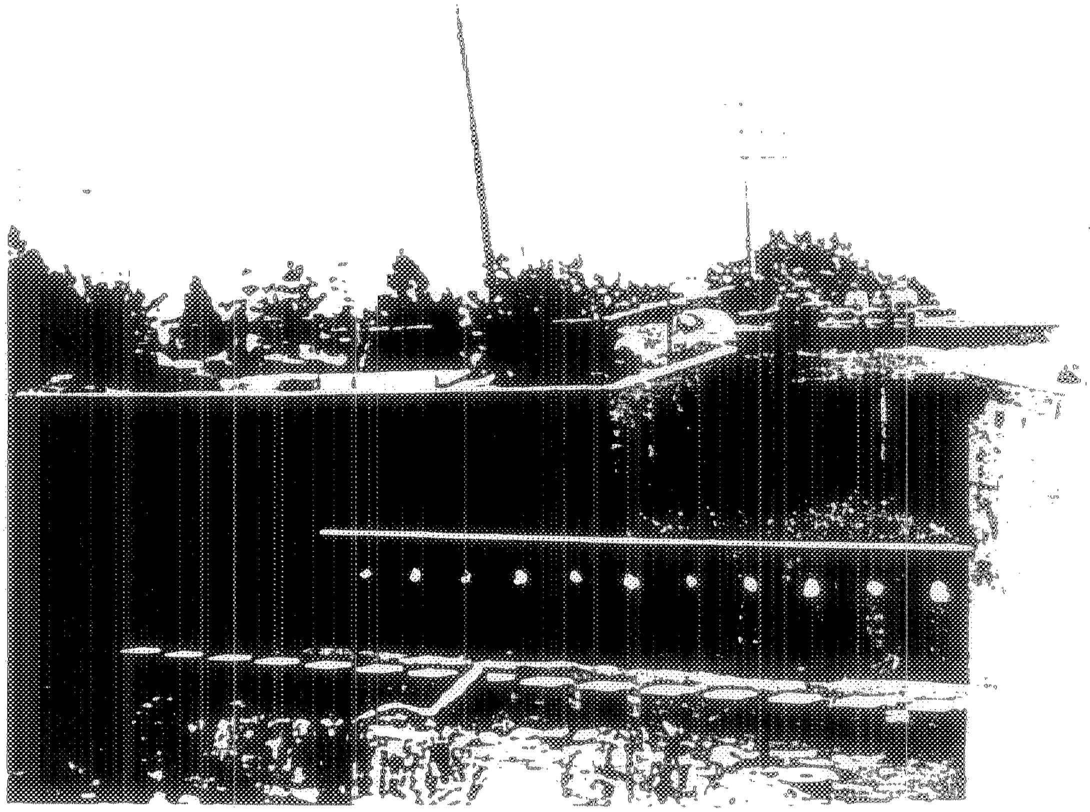
The Guadalupe - Coyote Resource Conservation District is aware of the poor quality of Lower Silver Creek fishery and is preparing to lead a fishery assessment and enhancement plan. The GCRCD has agreed to seek grants and other assistance to implement additional fishery enhancement features in the watershed. The items that the GCRCD is investigating to improve the fishery but cannot be funded by the presently proposed project include:

- Consult with the CA Dept. of Fish and Game to develop fishery enhancement measures that support steelhead migration in the watershed.
- Excavation of spawning sites and pools above the Thompson Creek drop structures
- Stirring and cleaning of gravel beds
- Install and maintain rearing pools and riparian habitat in upper watershed
- Citizen monitoring program to determine water quality and ongoing fishery needs
- Use Proposition 70 and 99 funds towards fishery restoration and operation
- Post signs and promote public awareness of fishery issues
- Continue implementing upper watershed Best Management Practices

See **Fishery Enhancement Plan (next page)** for locations of proposed features.

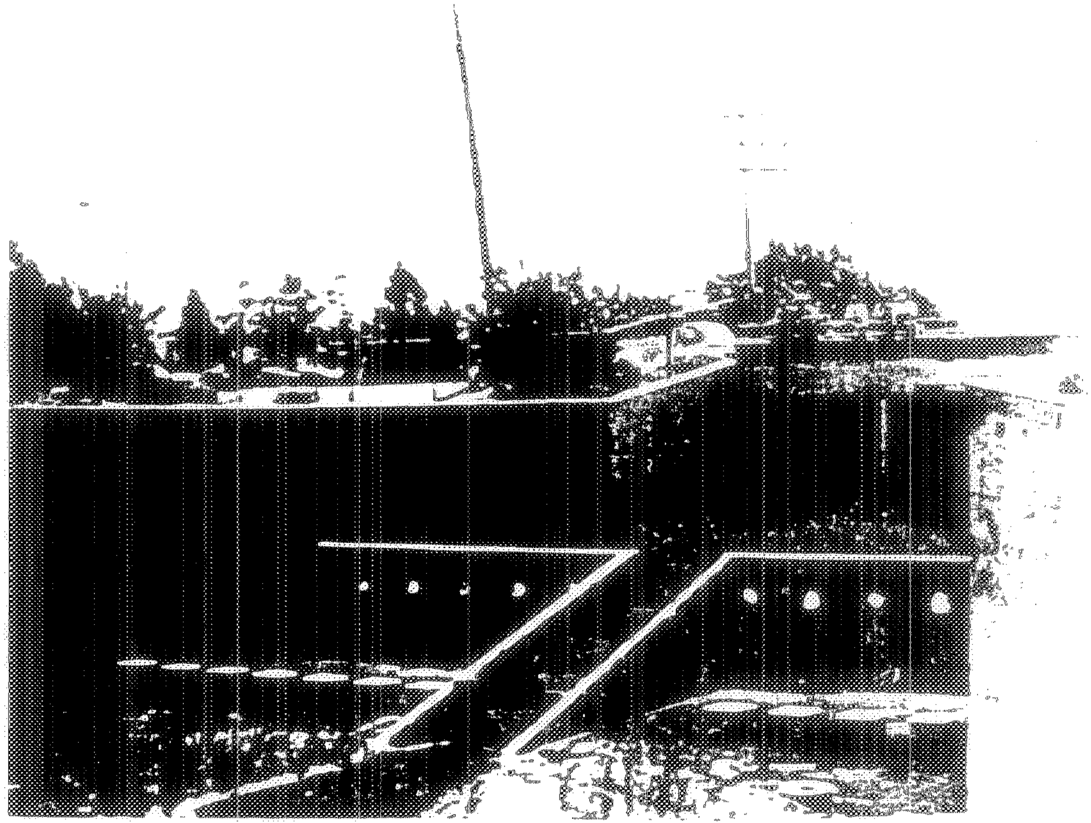
Proposed Thompson Creek Drop Structure

View of existing structure at Quimby Road.



Simulation of fish ladder and low-flow channel constructed to allow fish migration upstream.

Final design to be approved by California Dept. of Fish and Game and may not appear as simulated.

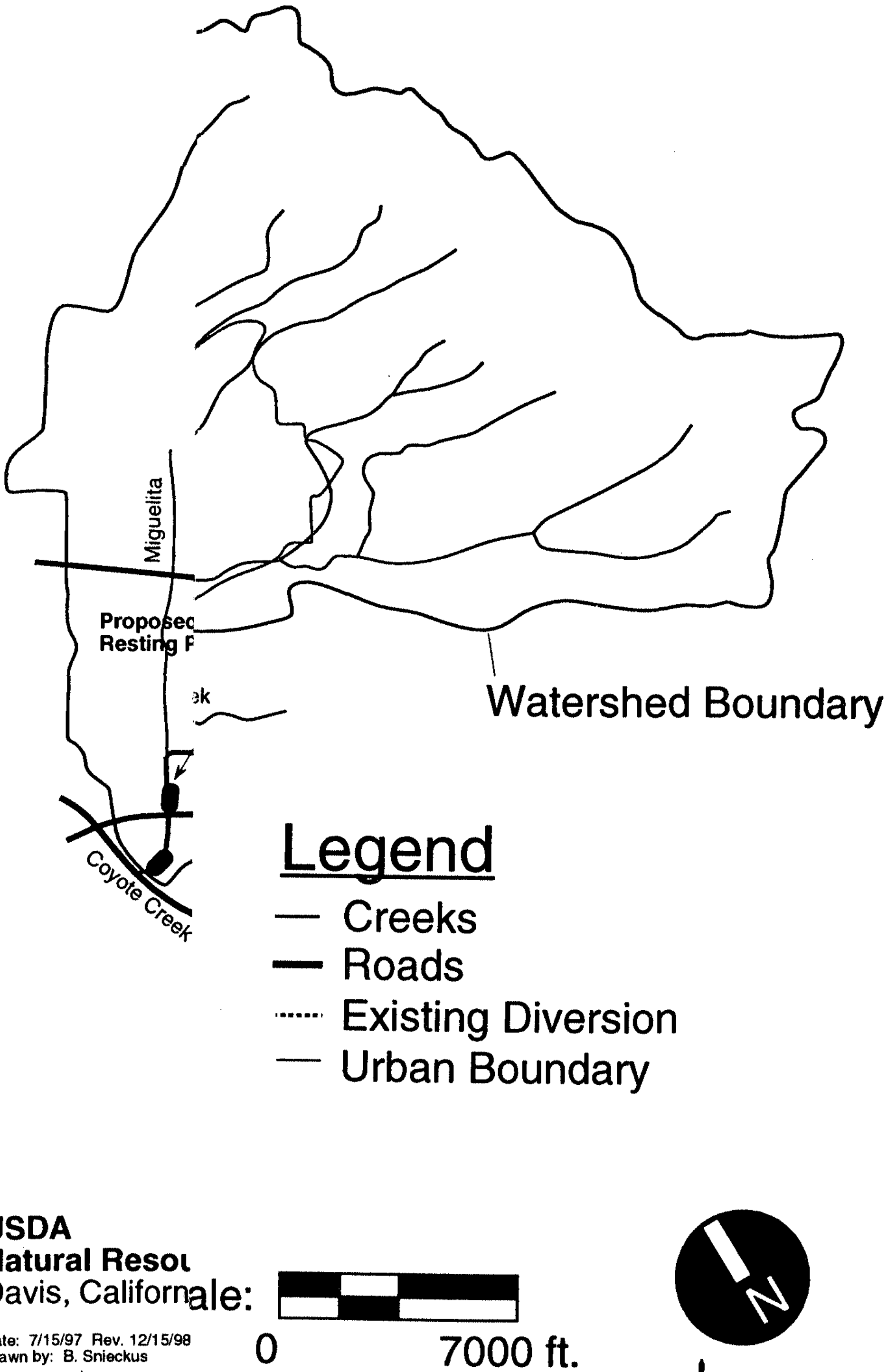


Lower Silver Creek

Fishery Enhancement Plan

Division of Res

USDA/ Natural Resourc
- Installation of low flow c
- Design and install restir
  clusters and boulder w
- Install riparian and wetl
- Coordinate mitigation a



USDA
Natural Resou
Davis, Californ

Date: 7/15/97 Rev. 12/15/98
Drawn by: B. Snieckus

Lower Silver Creek provides numerous recreation and education opportunities to the children of San Jose.

ORIGINAL MEASURES INVESTIGATED FOR THE 1983 PLAN

The following is a summary of flood control measures and alternatives considered during the original planning process for the 1983 Plan. **See Table - 1, page 9.**

Non-Structural Measures

A) Re-Zoning of the Floodplain:
We investigated the ability of re-zoning to prevent development in the floodplain. It was determined not feasible since development had already occurred throughout 95% of the flood zone.

B) Acquisition of Vacant Parcels:
Was determined not feasible since development had already occurred on 95% of the vacant land in the flood zone.

C) Relocation of Homes:
The relocation of homes was an economical solution in some cases. The measure was incorporated into original Alternative No. 2 but ultimately discarded due to lower net benefits.

D) Flood Proofing:
Flood proofing was an economical solution in some cases. The measure was incorporated into two Candidate Plans. Alternative 2 consisted of protecting five commercial properties, elevating 35 residences and constructing protective walls around 157 other buildings. Alternative No. 3 included flood proofing two industrial buildings.

E) Flood Warning:
Flood warning proved to be economical and a necessary component to flood proofing measures to allow occupants time needed to install portable flood shields.

Structural Measures

F) Floodwater Retarding Structures (Dams):
The 1983 Watershed Plan states that several sites were evaluated during planning but were discarded due to lack of large sites that could support significant storage. The focus was on a few large structures. This measure has been re-evaluated for feasibility and is included in the “New Measures” section of this report.

G) Off Channel Floodwater Retarding Structure, (Evergreen Lake):
This measure consisted of an off channel flood retarding structure located near Aborn and White Roads. This structure was designed to allow flood flows from Thompson and Fowler Creeks to be diverted into the reservoir. Under normal conditions low flows would bypass the reservoir. The reservoir was sized to contain 1567 ac-ft of flood flows. It was designed to pass only the flows that could be safely contained in the existing channel system downstream. After the storm, the reservoir would then drain slowly into Thompson Creek over a 10 day period. This alternative required purchase of 117 acres and the relocation of 5 houses and 5 out-buildings on the site. (The site selected for the structure is now a shopping center). The estimated 1983 cost including construction and land rights for this measure was $24,606,000 with a B/C ratio of 0.8.

H) Enlargement of Lake Cunningham:
Variations of this measure were considered during the 1983 planning process. They included the enlargement of the reservoir area, the deepening of the reservoir invert and the raising of the maximum water surface elevation.

Enlargement of the reservoir area consisted of extending the reservoir area to the south into a developing residential area. At the time, this required the purchase of an additional 91 acres and relocation of 30 houses. The reservoir capacity would be increased from 590 ac-ft to 1180 ac-ft. Peak discharges from the reservoir would be limited to 2,000 cfs. It would still require channel enlargement downstream to all reaches except Reach 6. The estimated 1983 cost including construction and land rights for this measure was $25,440,000.

Lowering the reservoir invert and water table elevation by constructing an open outlet channel was investigated. However, the required excavation for the open outlet would still require excavation to most of Lower Silver Creek, so this measure was rejected. The option of raising the water surface elevation was also rejected since induced flooding would occur along Flint and Ruby Creeks. Cost analysis for these measures was not performed.

Variations of this measure have been re-analyzed to determine if other methods of enlargement are feasible. They are included in the "New Measures" section of this report.

ORIGINAL ALTERNATIVES INVESTIGATED FOR THE 1983 PLAN:

After the possible measures that would contribute to solving the flood problems were identified, they were tested for their effectiveness, economic feasibility and environmental acceptibility. Three alternatives were formulated from combinations of viable measures:

Alternative #1, No Project:

The alternative of taking no action to reduce flood damages along Lower Silver Creek, total average annual flood damages would continue to occur. The 100 year flood would cause major damages in the amount of approximately $31,667,600.

Project Cost ('83 costs)	Avg. Annual Cost	Avg. Annual Benefits	B/C	Remaining Avg. Annual Damage
$0	$57,500	$0	----	$1,782,700

Alternative #2, Nonstructural Floodplain Protection:

This alternative was evaluated using 10, 25, and 100 year flood events for 50 separate zones within the floodplain. The 100 year event was selected as the candidate plan since it produced the greatest net benefits. This alternative includes relocating 10 residences and elevating or protecting197 buildings with perimeter walls and floodshields and installing a flood warning system. This alternative would cost:

Project Cost ('83 costs)	Avg. Annual Cost	Avg. Annual Benefits	B/C	Remaining Avg. Annual Damage
$3,010,000	$328,800	$635,900	1.9	$1,147,900

Alternative #3, Channel Enlargement and Floodproofing:

Thisalternative was evaluated for 25, 50, 100 and 500 year floods. The 100 year level protection provided the highest net benefits. This alternative included 0.87 miles of earth channel widening, 3.77 miles of concrete channel and flood proofing two industrial buildings.

Project Cost ('83 costs)	Avg. Annual Cost	Avg. Annual Benefits	B/C	Remaining Avg. Annual Damage
$13,954,000	$1,303,600	$1,613,500	1.2	$195,400

"Table K", the summary and comparison of candidate plans from the 1983 workplan is in **Appendix J.**

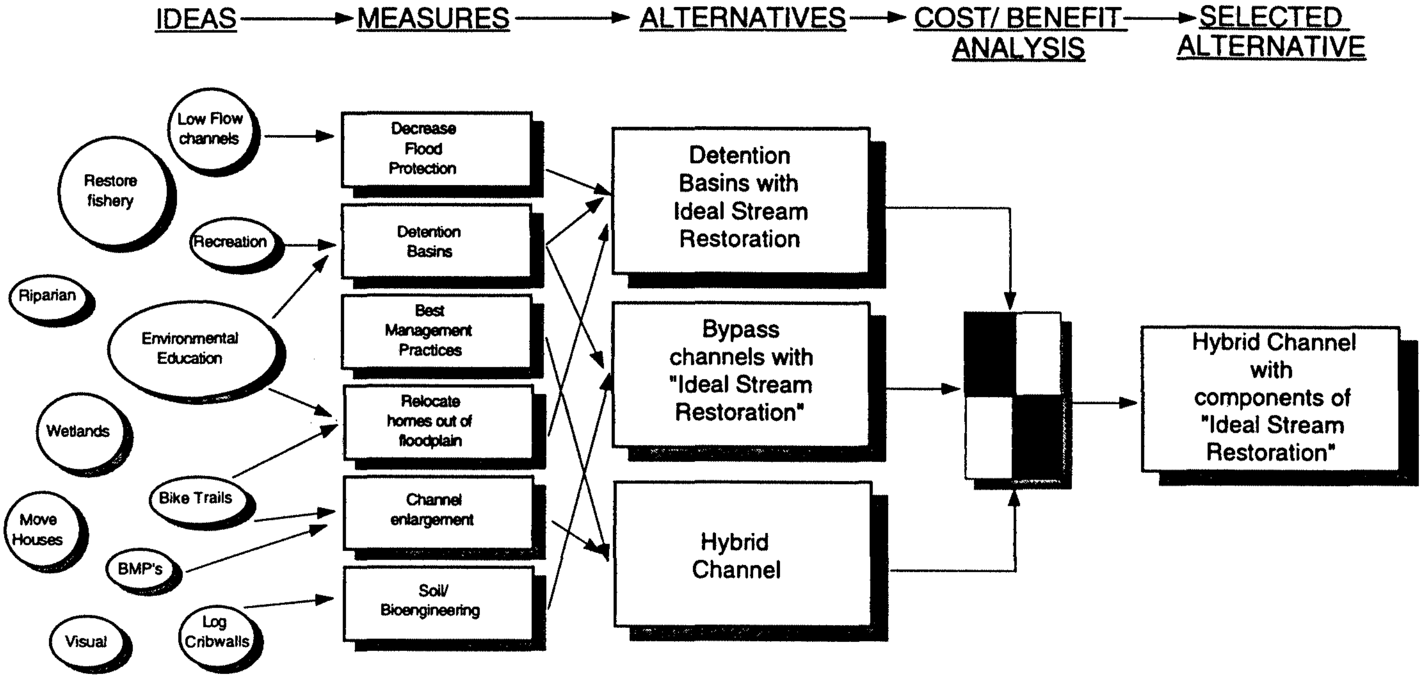
THE 1983 RECOMMENDED PLAN

The 1983 recommended plan (NED Plan) was Alternative #3, Channel Enlargement and Floodproofing, due to its greatest amount of damage reduction potential, ease of maintenance, mitigation features and positive benefit / cost ratio.

ANALYSIS OF NEW FLOOD REDUCTION MEASURES

During the initial design team meetings for revising the project plan, the group brainstormed any flood reduction and environmental improvement idea that could possibly be implemented in the watershed. The ideas that had technical merit were listed for further investigation without regard to cost. The ideas were then further refined into new measures. **See Analysis Flowchart** below. The alternatives were then developed by combining viable measures that as a whole would provide 100 year protection with various levels of environmental benefits.

Analysis Flowchart



The analysis of new alternatives includes variations of flood reduction measures initially investigated during the planning phase and preparation of the 1983 EIS/EIR, plus additional measures previously not investigated. Non-structural measures of floodproofing and relocation of homes was also re-evaluated due to changes that have occurred since origional planning. The alternatives were formulated with an effort to reduce the impacts to habitat values and mitigate environmental damages. For cost estimating and benefit /cost analysis, the alternatives provide the same 100 year flood protection benefits as the recommended plan in the 1983 EIS/EIR.

Environmental and social impacts of the various measures and subsequent alternatives and the required mitigation were not evaluated in detail. However, we have indicated where potential impacts are clearly significant. Costs for the various measures were developed using data from lists of recent construction contracts for similar work and McGraw-Hills "Dodge Guide to Public Works and Heavy Construction Costs". These costs were then indexed to 1993 using Engineering News Record and "Hink Chart"methods. Landrights costs were developed using the same unit cost described in the EIS/EIR for industrial, commercial, or residential property. The same costs were used for agricultural land that could be developed unless otherwise noted. Mitigation costs were based on recent contract costs or calculated as percentages of construction costs.

ANALYSIS OF NEW MEASURES

Analysis of new measures includes:

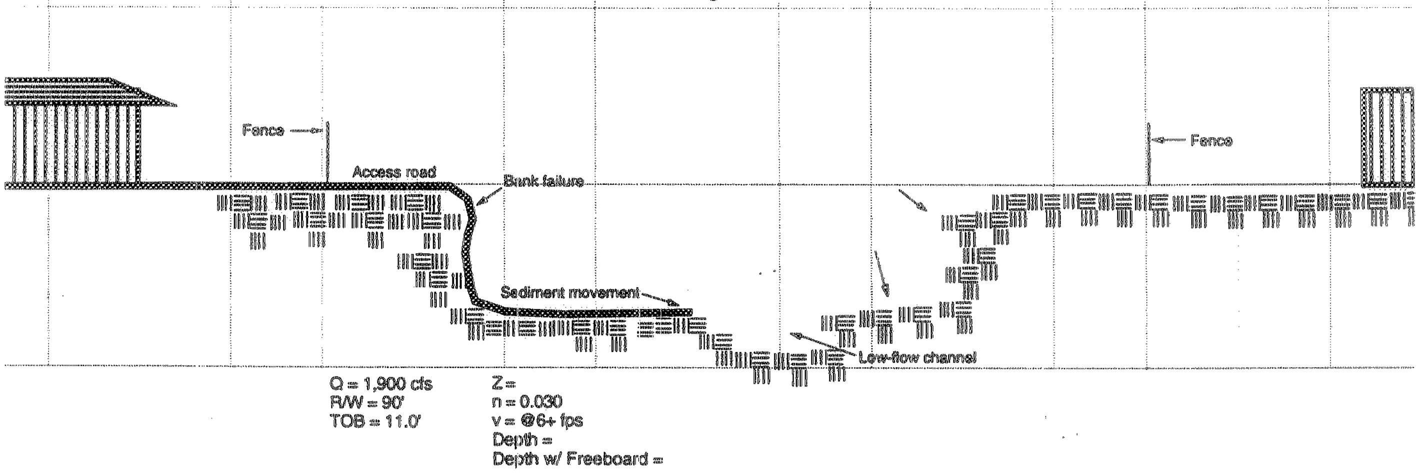
I) Decrease level of flood protection:
The possibility of reducing the level of flood protection was discussed in the initial design team meeting. If a lower level of flood protection could be chosen, a corresponding decrease in channel capacity would be needed. A smaller channel could possibly fit within the existing right-of-way. Less channel widening and concrete lining would be needed.

The Santa Clara Valley Water District and others strongly objected to reducing the level of protection. In representing the flood control desires of the people of San Jose, the SCVWD indicated that public health and safety would not be improved with any flood control reduction. The residents presently in the path of potential damaging floods are insisting on complete protection to the 100 year level. According to the SCVWD, the flood insurance premiums these residents are paying are a great source of contention.

J) Allowing erosion to increase the capacity of existing Lower Silver Creek:
The existing Lower Silver Creek was analysed for its present ability to convey flood flows. The present capacity ranges between 1,700 to 2,500 cfs depending on the channel reach. These figures are considerably less than the required channel capacity of between 3,600 to 5,630 cfs. In addition to the inadequate capacity, the creek is very unstable. The existing side slopes are experiencing severe erosion and in some areas complete bank failure. **See Existing Section below.** If the earth channels were reshaped and vegetated to protect the banks from erosion, the coefficient of roughness ("n") would increase due to vegetation and further reduce the channel capacity to approximately 1,500 to 2,300 cfs. So stabilizing the existing channel alone would hinder our flood reduction efforts.

Several design team members asked us to investigate the benefits of the erosion in order that "channel capacity would increase and transported sediment could support additional wetlands". It may be true that channel capacity and wetlands might increase, however, the constant addition of large amounts of sediment would continue to negatively impact Coyote Creek and San Francisco Bay. The constant slope failures would eventually endanger many houses and other public and private structures. **See Photo - next page.** All viable flood control alternatives are required to have proper velocities and slope protection to insure stable banks and channel bottoms.

Existing Section



Bank Failures on Lover Silver Creek are contributing large amounts of sediment to Coyote Creek and San Francisco Bay.

K) Enlarging the Earth Channel:
We investigated enlarging the existing earthen channel within the present right of way to reduce or eliminate the need for concrete lining as proposed in the 1983 EIS/EIR. The constraints associated with this scenerio were:

- The channel must generally fit within the existing right-of-way.
- The channel invert slope can not exceed that shown in Table 3B of the 1983 EIS/EIR since the existing inlet, outlet and intermediate elevations at existing box culverts are fixed.
- The water surface elevation should not exceed that shown in Table 3B in the EIS/EIR to allow surface runoff from adjacent properties to drain into the channel.
- Mannings roughness coefficient for the aged condition will vary from .035 to .040 to represent a vegetated earthen channel with some woody vegetation providing shade to the low flow channel.
- The "As Built" allowable velocity should be restricted to approximately 4.5 fps to ensure a stable channel.

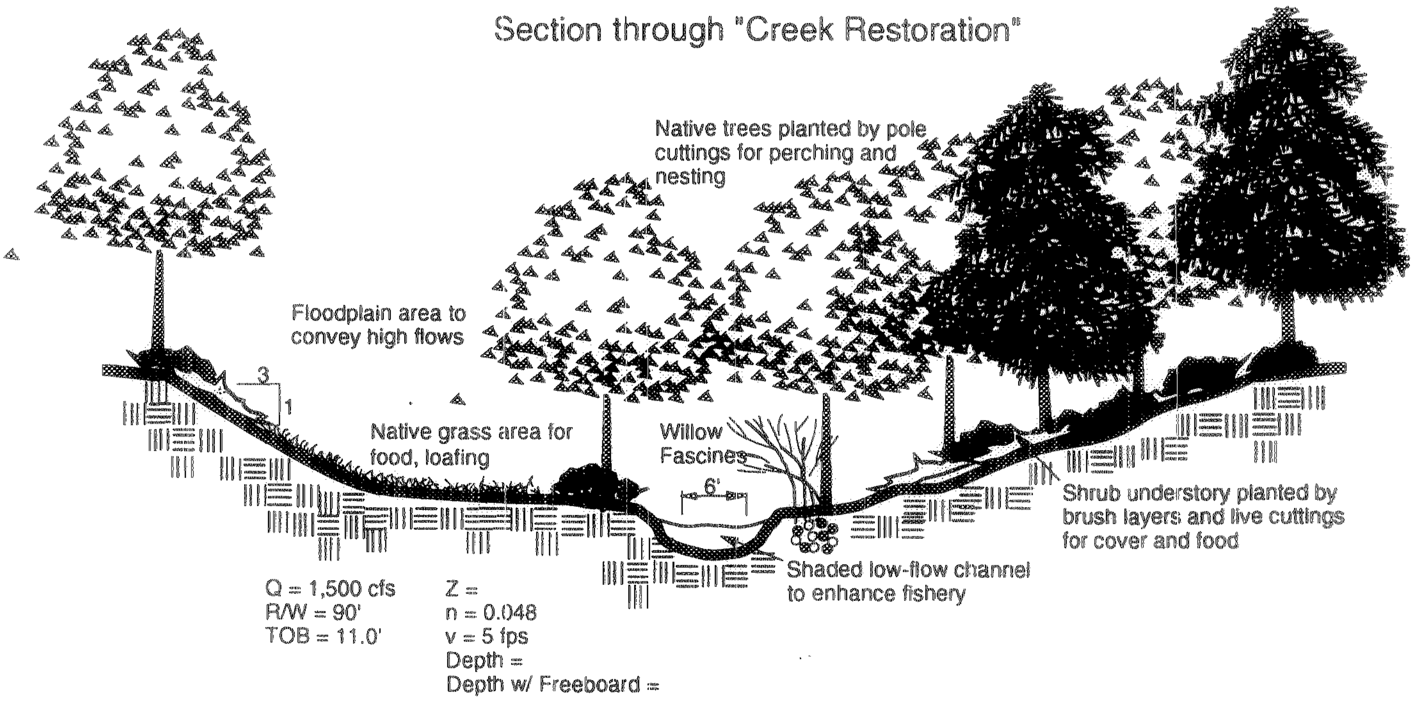
We hypothetically enlarged the channel cross section to the maximum within the existing right-of-way. Even though the channel was enlarged and vegetated, the channel capacity was again reduced to below the capacity of the existing channel. Due to the increased vegetation in the new channel, the "n" value increased to 0.040 from the existing channel's "n"of 0.030. Also, some of the existing reaches have grades that are too steep to support stable, slow flows and must be flattened. The gentler gradient further slows the flow.

Only in three of the reaches is there adequate right-of-way to allow a wider channel. In these reaches, the wider channel could offset the increased roughness and provide additional capacity over the existing channel. However, there is danger in increasing the capacity of one reach when the channel downstream can not carry the discharge. The purchase of additional right-of-way and relocation of families living along the channel to accommodate a wider earthen channel was not considered a reasonable option due the high landrights costs and political and social impacts this would cause.

Since the channel capacity would only be reduced with a vegetated earthen channel, there are no flood control benefits associated with this measure. This investigation did however lead us to methods that would reduce the extent of cast in place concrete lining in Reaches 4 through 6 as well as habitat restoration measures that could be incorporated within the channel cross section. These measures are presented in greater detail in the 1997 Recommended Plan section of this report.

L) Capacity of an "Ideally Restored" Lower Silver Creek:

The section below illustrates an "ideal" representation of a creek restoration along Reach 4 of Lower Silver Creek. A two stage earth channel is constructed within the existing right-of-way. The low flow channel is sized for the two year flow and meanders along the center of the floodway. The low flow is shaded by native trees and shrubs to reduce the growth of cattails. The trees and shrubs also provide a source of insects and organic matter for the fishery. A series of resting pools and riffles would be incorporated in with the low flow to improve fish habitat.


Section through "Creek Restoration"
Native trees planted by pole cuttings for perching and nesting
Floodplain area to convey high flows
3
1
Native grass area for food, loafing
Willow Fascines
6'
Shrub understory planted by brush layers and live cuttings for cover and food
Shaded low-flow channel to enhance fishery
Q = 1,500 cfs
R/W = 90'
TOB = 11.0'
Z =
n = 0.048
v = 5 fps
Depth =
Depth w/ Freeboard =

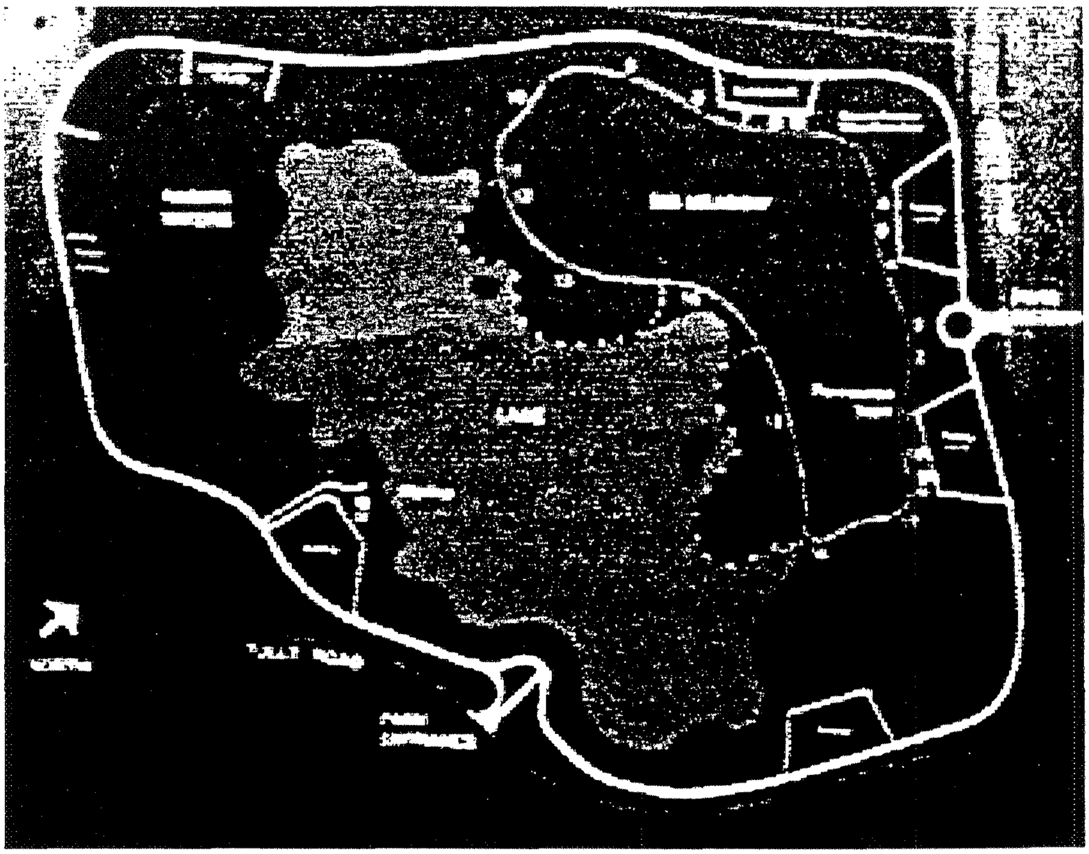
Other native trees, shrubs, vines and grasses would be planted up the slopes and on top of the banks to provide additional songbird, waterfowl and amphibian habitat. The trees and shrubs would provide nesting and perching areas. The grass would provide loafing and grazing areas as well as slightly higher flow capacity.

This channel cross section has a very high coefficient of roughness that would allow a maximum flood capacity of approximately 1500 cfs in this reach. The 100 year flow at this location is approximately 4600 cfs, more than three times the proposed capacity. Since this measure is not viable in itself, we investigated alternatives that combine this channel restoration concept with several flow reduction strategies.

M) Increase floodwater storage at Lake Cunningham:

Generally, the most desirable approach to provide flood protection in a developed floodplain is a flood detention based alternative rather than a conveyance based approach characterized by channels or diversions. The flood detention approach addresses the problems closer to the source rather than shifting the impacts of flooding downstream.

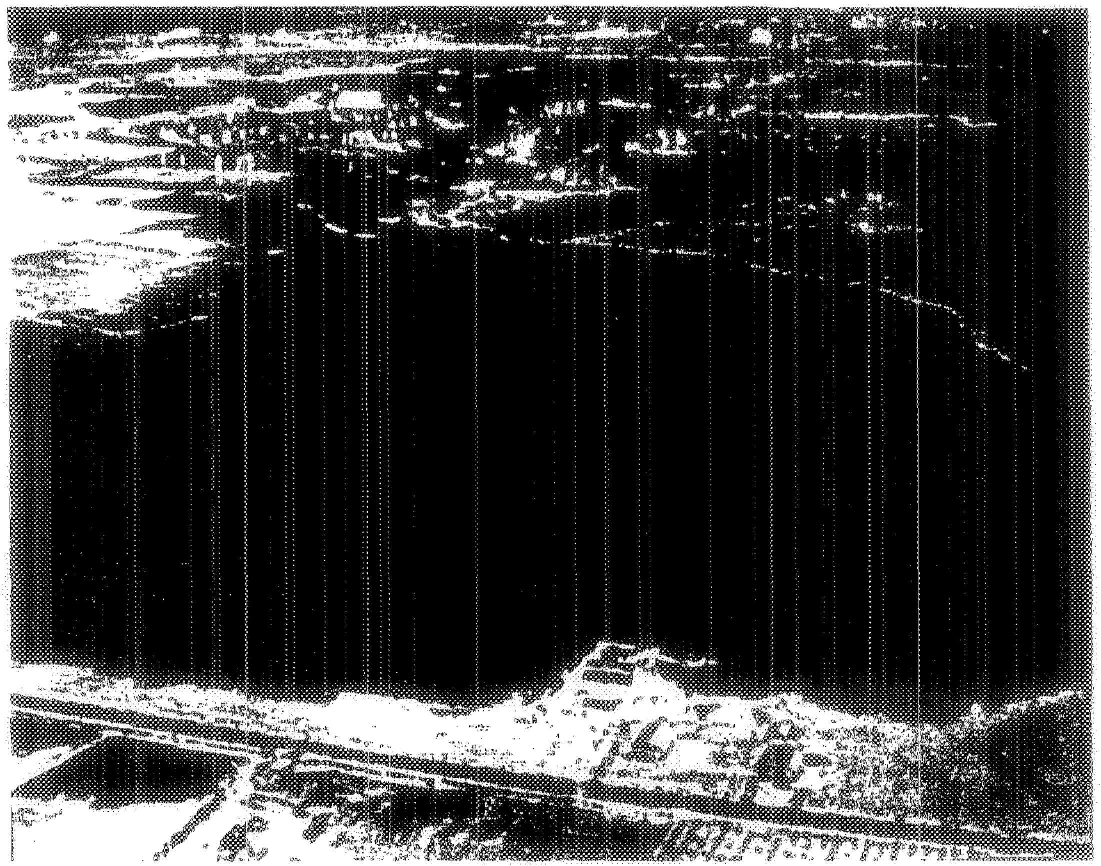
Lake Cunningham was built as a multi-use facility for joint flood reduction and recreational uses. In its present configuration, Lake Cunningham has approximately 590 ac-ft of flood storage. The 190 acre site also contains an aquatic recreation center and park and is bounded on four sides by Cunningham Ave., White Road, Tully Road and Capitol Expressway.



Overview of Lake Cunningham

The facility's history: According to the May 1978 *"Lower Silver Creek, Lake Cunningham and Thompson Creek Planning Study"* prepared by the Santa Clara Valley Water District, the floods of 1952, 1955, 1958 and 1967 caused considerable damage to existing homes and businesses in the area. During those storms, the agricultural area between Cunningham Avenue and Quimby Road east of Capitol Expressway frequently flooded. The area, a natural basin in the landscape, detained overland flows from the undefined channels of Flint and Ruby Creeks and excess flows from Silver Creek. The constant inundation discouraged urban development on the site.

1952 Flood in Lake Cunningham Area



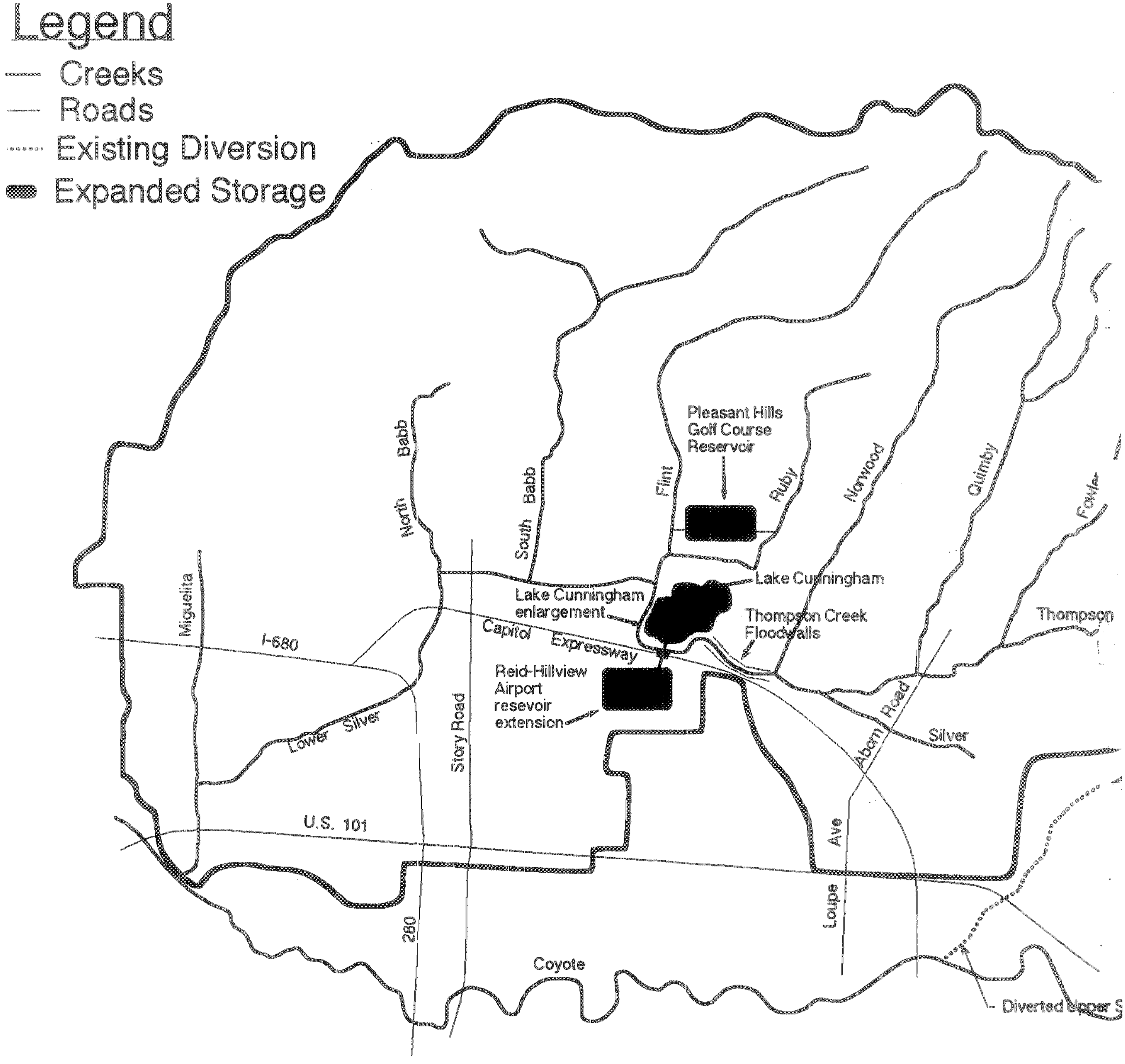
As illustrated in the 1976 Master Plan for Lake Cunningham Park, the park was designed as a multi-purpose facility with both flood control and recreation benefits. The City of San Jose and the Santa Clara Valley Water District jointly prepared the conceptual design of the facility for the dual use. The city's rapid expansion to the south created a great demand for new recreation facilities. SCVWD's need for flood detention was realized when it was calculated that the combined one percent flows from Flint, Ruby, Thompson and Silver Creeks would exceed 4250 cfs into Lower Silver Creek at Cunningham Avenue. A larger concrete channel would have to be built to carry those flows within the available right-of-way to Coyote Creek.

The detention basin in the park reduces the peak flow to Lower Silver Creek. The construction of the basin allowed the SCVWD to reduce flood control costs by reducing the size of the channels required downstream of Cunningham Avenue and eliminating the construction of channels for Flint, Ruby and Silver Creeks within the Lake Cunningham Park area. The city benefited in the cooperative design process. The SCVWD contributed some of the reduced flood control cost savings to the construction of the park.

Before the Lake Cunningham project was built, there were small areas of emergent marsh at the confluence of Flint, Ruby and Silver Creeks. The areas were removed when the lake was excavated. The lost wetland and riparian habitat was fully mitigated for in the design of the park. A net gain of approximately 4 acres of wetland and riparian habitat presently exists within the park boundary along the re-aligned creeks.

An analysis of enlarging Lake Cunningham was considered during the preparation of the EIS/EIR and found to cost approximately $25.4 million. Enlargement was proposed by increasing the surface area of the lake to the south in a previously undeveloped residential area. This area is now fully developed.

Increase Lake Cunningham Capacity



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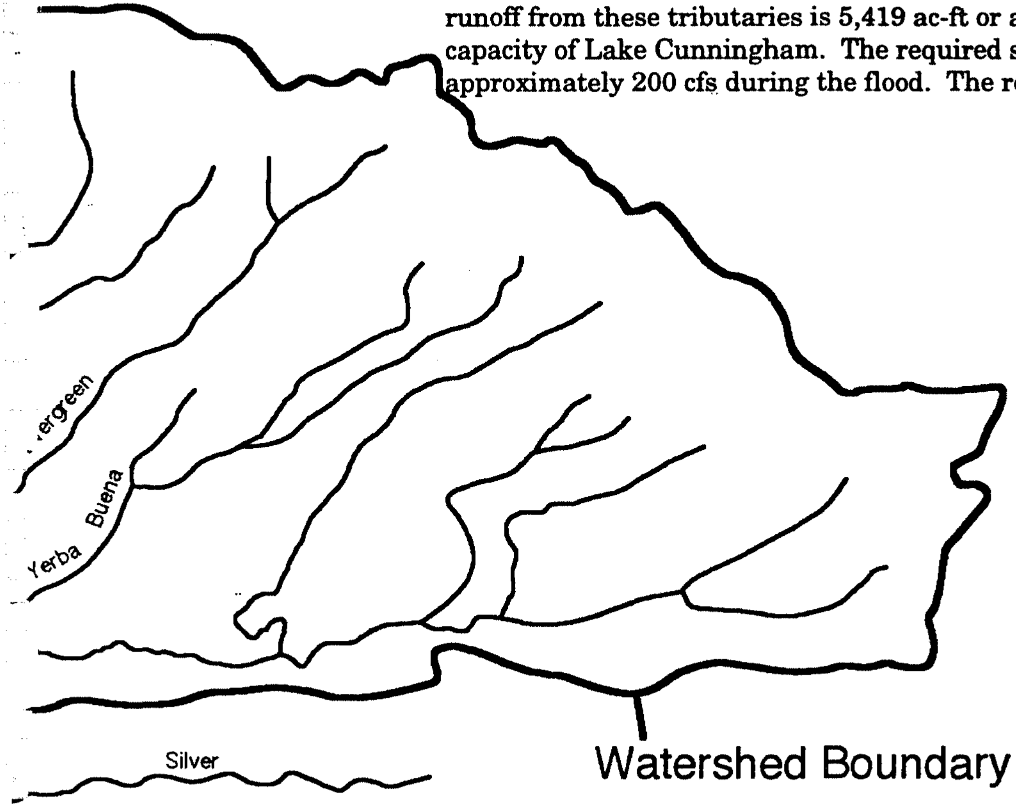
A re-analysis of enlarging Lake Cunningham was performed for this plan update. Four variations were investigated:

- **Lowering the basin invert.**
- **Increasing the surface area of the lake.**
- **Raising the water surface elevation to elevation 150.**
- **Raising the water surface elevation to elevation 155.**

Runoff volumes produced from Flint, Ruby and Thompson Creeks during the 100 year, 24 hour storm are approximately 4,693 ac-ft, 313 ac-ft and 413 ac-ft respectivly. Total runoff from these tributaries is 5,419 ac-ft or about 10 times the current storage capacity of Lake Cunningham. The required storage could be reduced by releasing approximately 200 cfs during the flood. The reduced storage requirement therefore is 4,758 ac-ft for all four of the options investigated.



This flow combined with downstream tributaries still produces flows exceeding the present channel capacity for Reaches 1, 2, 3 and 4. Channel enlargement would be required for Reaches 1 and 2 plus the construction of flood walls for Reach 3 and 4 for all four of the following options.

M1) Lowering the Basin Invert

Lowering the basin invert produced the required storage when the entire site was allowed to flood and the permanent pool elevation was lowered from the present elevation 119.2 to elevation 105. This required the removal and reconstruction of the aquatic park and recreational facility, installation of 8,700 linear of concrete pipe to provide a gravity drain for the reservoir and the off site disposal of all excavated material. The periodic flooding of the aquatic park would result in lowered project benefits. Damages to the facility after floods would have to be repaired. This constant expense was determined to be unacceptable to the City and operator of the facility. The estimated construction cost of this measure is approximately $108.7 million.

M2) Increasing the Lake's Surface Area
Increasing the surface area of the lake could be achieved by extending the reservoir area to the west and include a portion of the Reid-Hillview County Airport. This would require the construction of bridges or culverts under Capital Expressway to connect the two reservoirs. This alternative is comparable to the Lake Cunningham expansion that was evaluated during planning and estimated to cost $25.4 million in 1983 dollars. The high cost of providing the required flood storage with this or similar alternatives is due in part to the cost associated with the excavation and disposal of all material needed to produce the required storage. The estimated construction cost of this measure is approximately $55.5 million.

M3) Raising the Water Surface to Elev. 150
Raising the maximum water surface elevation of Lake Cunningham from approximately 130 to elevation 150 was investigated. This option would require the construction of levees and flood walls around Lake Cunningham and along Thompson Creek. The construction of a reservoir at Pleasant Hills Golf Course to collect runoff from Flint and Ruby Creeks would also be required. The golf course could either be reduced from 18 holes to 9 holes with a detention basin or the nine holes could be re-constructed within the basin. This alternative would also keep the aquatic park intact but this facility would flood periodically, thus lowering the project benefits.

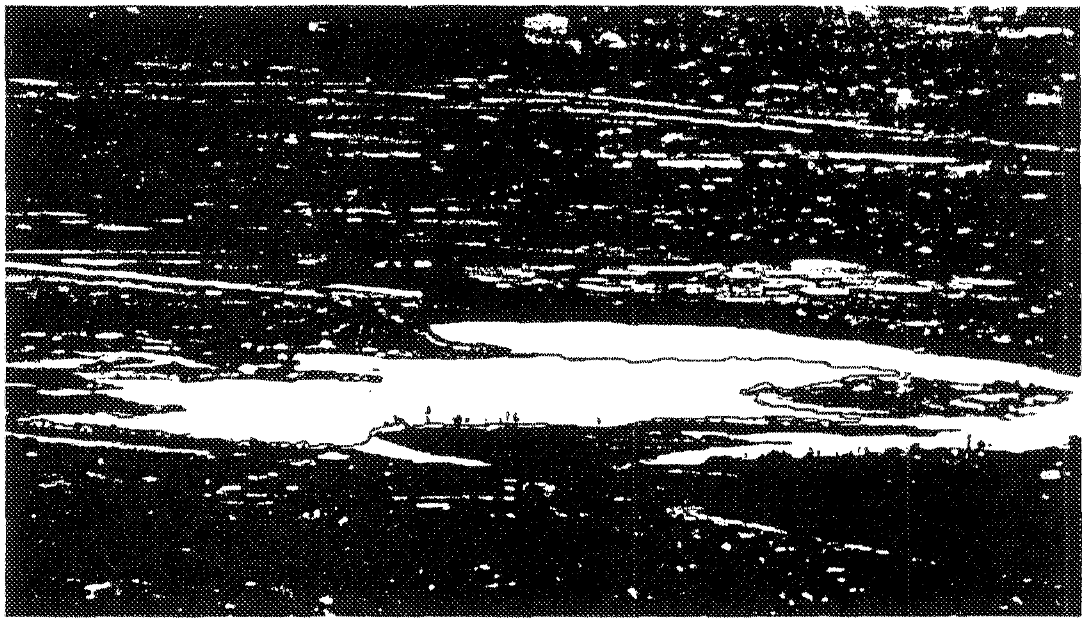
A study of the watershed hydrology showed that channel enlargement to Reaches 1 through 4 would be required if Flint and Ruby Creeks were left uncontrolled. Twenty foot high floodwalls or levees would need to be constructed on both banks on Thompson Creek. They would extend upstream approximately 5,800 lf. and would be extremely cost prohibitive and environmentally damaging.

This alternative essentially creates a very inefficient, long and narrow flood storage basin. Both banks of Thompson Creek are developed negating the possibility of widening to accommodate the construction of set back levees. Levees would encroach into Thompson Creek eliminating riparian habitat upstream of Lake Cunningham. The periodic flooding of the aquatic park and golf course would result in lowered project benefits and is unacceptable to the City, the operators of the park and golf course. Construction costs for this measure would be in excess of $50 million. Landrights cost for 65 acres at the Pleasant Hill Golf Course might exceed $9.3 million. Mitigation costs could be as high as $1.1 million for a total cost of $69.5 million.

M4) Raising the Water Surface to Elev. 155
This measure would raise the water surface elevation of Lake Cunningham to elevation 155 and collect runoff from Flint, Ruby and Thompson Creeks. The flood pool would cover the entire Lake Cunningham site and periodically flood the aquatic park, thus reducing the project benefits. Borrow materials needed to construct the embankments could come from open areas in the lake and not require the removal and replacement of the recreational facilities. The storm drain system for Flint and Ruby Creeks would be modified and include closed conduits that discharge the peak runoff into Lake Cunningham. The closed conduits would become pressurized as the flood pool elevation increases. The closed system would be needed so that flood flows would not back up into the adjoining neighborhoods. Flap gates normally used for this type of application are not appropriate since the peak flows for these creeks occur at around hour nine of the 100 year, 24 hour storm. At that hour, the flood pool elevation would be too high to allow the flap gates to open. A parallel storm drain system would need to be constructed adjacent to the closed conduits to drain the adjacent land areas.

A pressure conduit would also be constructed on Thompson Creek. The conduit would follow one side of the right of way in an effort to preserve as much of the existing wetlands and riparian vegetation as possible. The closed conduit would extend upstream from Lake Cunningham approximately 5,600 lf. A diversion structure would be constructed at elevation 160, about 1/4 mile upstream of Quimby Road, to divert low flows into the existing channel and divert the flood flows into the closed conduit. The existing channel cross section could be reduced to accommodate the closed conduit and still provide wetland and riparian habitat. Areas adjacent to the closed conduit would drain into the earth channel. The earth channel would follow its present course to Lower Silver Creek at Cunningham Avenue.

Periodic flooding of the aquatic park would result in lowered project benefits and is unacceptable to the City, operator of the facility and the public. The cost for this measure exceeds $36 million.



Simulation of Lake Cunningham in a 100 Year Flood. Red line indicates normal pool.

Simulation of Lake Cunningham with Capacity increased.

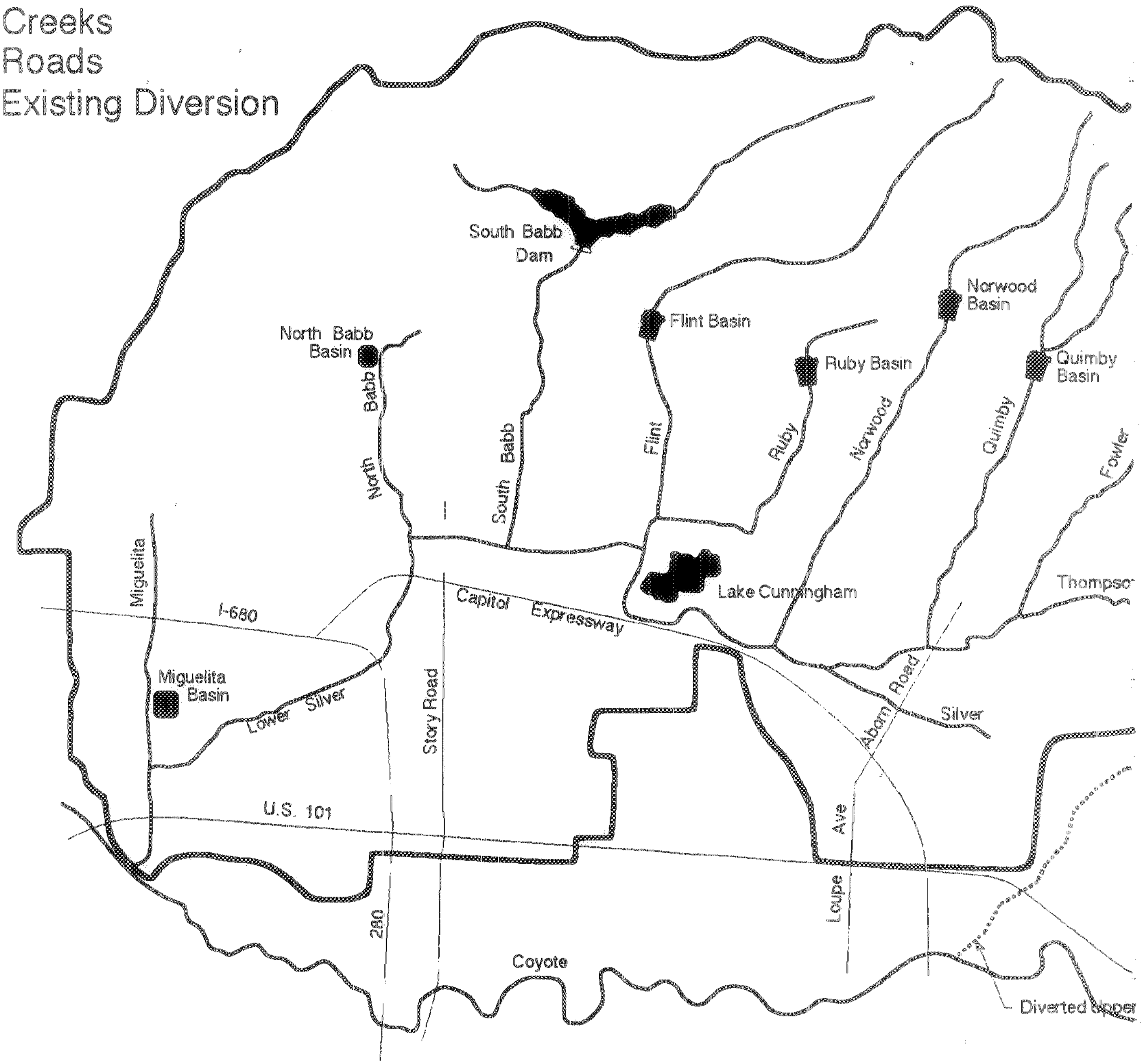
Upper Watershed Flood Detention Structures

Legend

— Creeks

Roads

······ Existing Diversion



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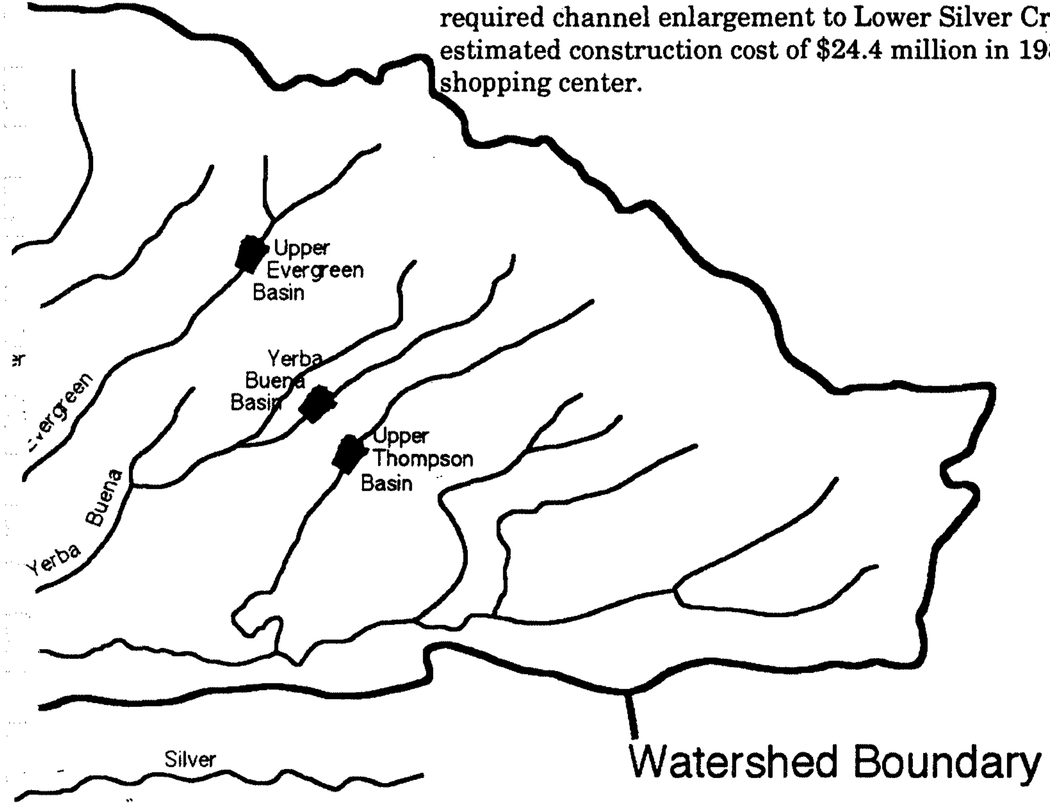
N) Upper watershed flood detention structures:

Lower Silver Creek collects runoff from twelve separate sub-watersheds. From south to north, the sub-watersheds include the following creeks that discharge into Thompson Creek: Yerba Buena Creek, Evergreen Creek, Fowler Creek, Quimby Creek, Norwood Creek. The following streams discharge into Lower Silver Creek downstream of Lake Cunningham: Ruby Creek, Flint Creek, South Babb Creek, North Babb Creek and Miguelita Creek.

A review of the data used to develop the 1983 EIS/EIR shows that an off-site flood detention structure was evaluated near the intersection of White and Aborn Roads to collect peak runoff from Thompson Creek and Fowler Creek. This measure still required channel enlargement to Lower Silver Creek Reaches 1 through 5 with an estimated construction cost of $24.4 million in 1983 dollars. This site now contains a shopping center.

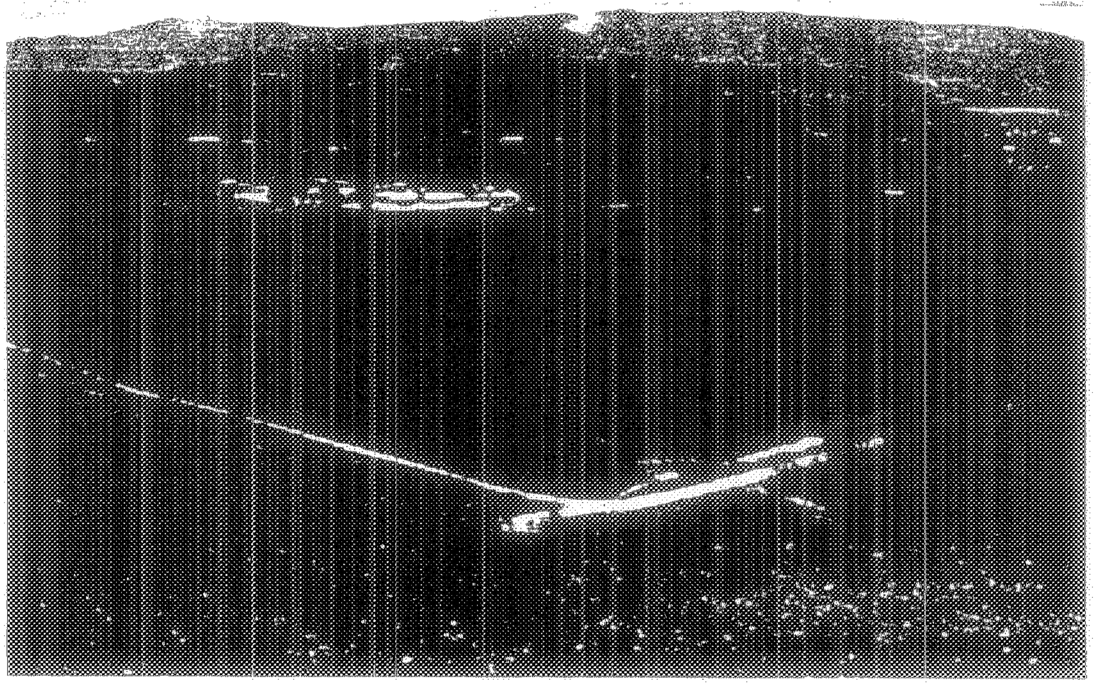


We investigated the cumulative impact detention basins on all of Thompson's and Lower Silver's tributaries would have on Lower Silver's peak discharge. We hoped that these structures could operate in conjunction with Lake Cunningham's detention capacity to provide protection from the 100 year event. Lower Silver could then be restored to a two-stage revegetated earth channel.

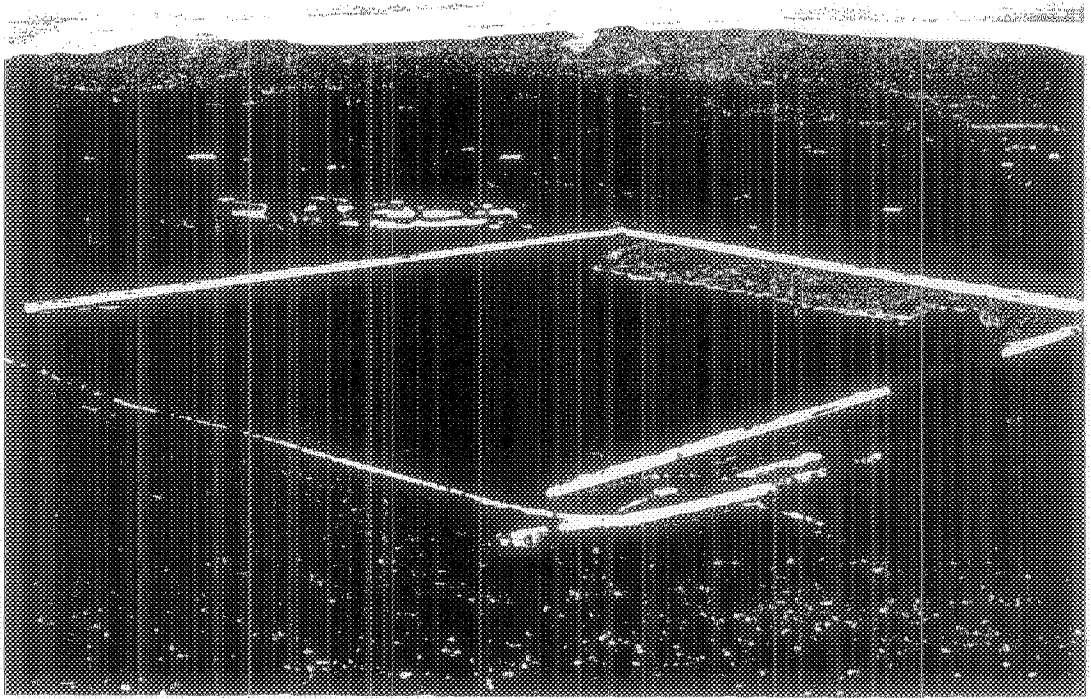
Three distinct types of structures were considered based on the topography of the site. The first type consists of an excavated, off channel basin. This structure is needed in flat topography and is expensive due to the need to excavate the reservoir to match the required storage volume. This is a low hazard structure since the storage is below the natural ground elevation. The inlet and outlet structures can also be smaller and less expensive than those required for high hazard, state size dams.

The second type of flood retarding basin is a combination of cut and fill embankment that is constructed on sloping topography characteristic of channels on alluvial fans. The embankment is shaped similar to a horseshoe with fill required on three sides of the reservoir. This structure is a high hazard structure since the water surface is above adjacent ground.

Photo of watershed along Fowler Creek.



Simulation of Fowler Detention Basin.



The third type of flood retarding structure consists of an embankment or dam crossing a stream channel and matching the high ground on each abutment. This is generally the most economical type of dam to build since a large reservoir area can be achieved with a minimum amount of excavation and fill. This also is a high hazard structure due to its location upstream of a large population.

Seismic Risk

The San Jose area is a high risk seismic area and presents additional hazards to dams. With several of the proposed sites for the basins directly over or near the Quimby or Evergreen faults, structural integrity could be compromised in an earthquake. Defensive measures against failure during an earthquake include flatter side slopes for the embankments, greater freeboard above the pool elevation, deeper foundation excavation for the embankment and the inclusion of a clean, granular chimney drain to prevent piping failures through the embankment. All of these defensive measures increase the cost of the embankment and were considered during the development of these alternatives. High risk dams are also required to have large emergency spillways designed to discharge very large flows to reduce the possibility that the dams would ever overtop during a storm.

Flood detention structures were considered on each tributary to Lower Silver Creek. Most of the sites selected as possible dam sites were generally at the base of the hills and on the fringe of the urban development. These sites were selected from aerial photos and verified on the ground. It was assumed that the sites were available and feasible as dam sites. The flood reduction affects were evaluated one dam at a time until the resulting channel flows could be contained in the existing channel.

It was determined that construction of all eleven flood retarding structures did not reduce the channel flows downstream to a level that could be contained in the existing channel. Either additional basins would have to be constructed in the lower areas of the watershed or further enlargement of the channel would be required. The total construction cost for all eleven basins is $37.7 million plus $110.3 million for landrights resulting in a total cost for this alternative of about $148 million. Mitigation costs would be approximately $1.5 million for a total cost of $149.5 million.

The following information describes each of the eleven basins considered:

1) Miguelita Basin

This is an excavated basin on Miguelita Creek approximately 3,000 linear feet upstream of the confluence with Lower Silver Creek. This site is relatively flat and contains an existing park. The park would be converted into an off channel, excavated basin with a structure to divert low flows into the existing channel and flood flows into the reservoir. A concrete drain pipe would outlet at Lower Silver Creek to provide a gravity drain to empty the reservoir in 8 days. The reservoir would be limited in size by a maximum depth set by the slope of the drainpipe and available acreage at the site. Flood storage would be 418 ac-ft.

2) North Babb Basin

This is an excavated basin located at the Cureton School north of North Babb Creek. This basin would be located at the athletic field which would be lowered in a stadium configuration. Flood water would be stored in the basin causing the fields to be unusable during and for several days after the storm. Concrete conduits would divert flood flows from North Babb Creek, fill the reservoir and drain through a smaller pipe back into the creek following the flood. Low flows would remain in the creek. This basin was sized to contain the entire runoff volume resulting from the 100 year - 24 hour storm - approximately 202 ac-ft.

3) South Babb Dam

This is a traditional embankment type dam constructed at elevation 400 on South Babb Creek. The only excavation required for this dam was that needed for the foundation, the emergency spillway and additional borrow material needed to construct the dam to finish grade. The dam would store the entire flood hydrograph, 761 ac-ft, resulting from the 100 year - 24 hour storm. The flood pool would cover approximately 20 acres. Landrights cost for this property was adjusted to reflect the cost for agricultural land not subject to development. (@ $12,600/acre in 1993 dollars). This is the only site that was considered not developable for residential or commercial uses.

4 thru 11) Additional Basins

All remaining 8 flood detention basins are the combination excavation/fill type of embankments with earthfill placed on three sides of the reservoir and constructed on alluvial fans of varying slopes. The reservoirs for these basins were sized to collect the runoff volume from the 100 year - 24 hour storm and then drain in the following 8 days. See Table 1 for the storage requirements and cost summary for these structures.

TABLE - 2: UPPER WATERSHED FLOOD DETENTION BASINS

Basin	Storage ac-ft	Const. cost	Area acres	Landrights cost	Total cost	Cost/ ac-ft
1. Miguelita	418	$11,500,000	22	$0	$11,500,000	$27,512
2. North Babb	202	$5,673,000	5	$1,600,000	$7,273,000	$36,005
3. South Babb	761	$2,116,000	20	$252,000	$2,368,000	$3,112
4. Flint Creek	271	$1,436,000	23	$9,853,400	$11,289,400	$41,658
5. Ruby Creek	83	$956,000	12.6	$5,397,840	$6,353,840	$76,552
6. Norwood Creek	192	$1,280,000	18.6	$7,968,240	$9,248,240	$48,168
7. Quimby Creek	189	$1,218,000	18.3	$7,839,720	$9,057,720	$47,924
8. Fowler Creek	390	$1,874,000	29.4	$12,594,960	$14,468,960	$37,100
9. Upper Evergreen	227	$1,307,000	21	$8,996,400	$10,303,400	$45,389
10.Yerba Buena	328	$1,530,000	29.6	$12,680,640	$14,210,640	$43,325
11.Upper Thompson	800	$4,462,000	65	$27,846,000	$32,308,000	$40,385
					$128,381,200	

Notes:

1. Costs are in 1993 dollars. The 1998 cost would be $147,638,380.
2. Construction cost does not include engineering, mitigation or administration costs.
3. Landrights cost does not include administration costs.

O) Lower watershed flood detention structures:
The City of San Jose and the County of Santa Clara have been implementing flood detention measures in the lower watershed urban area. Some of the existing measures include: on site detention basins constructed by developers as land is converted from agricultural to urban use and constrictions to the existing storm drain system to create temporary storage on city streets. The storm drain system is intentionally designed for the 10 year event rather that the higher flows associated with larger storms. The detention benefits of these existing measures are already included in our hydraulic analysis of the watershed.

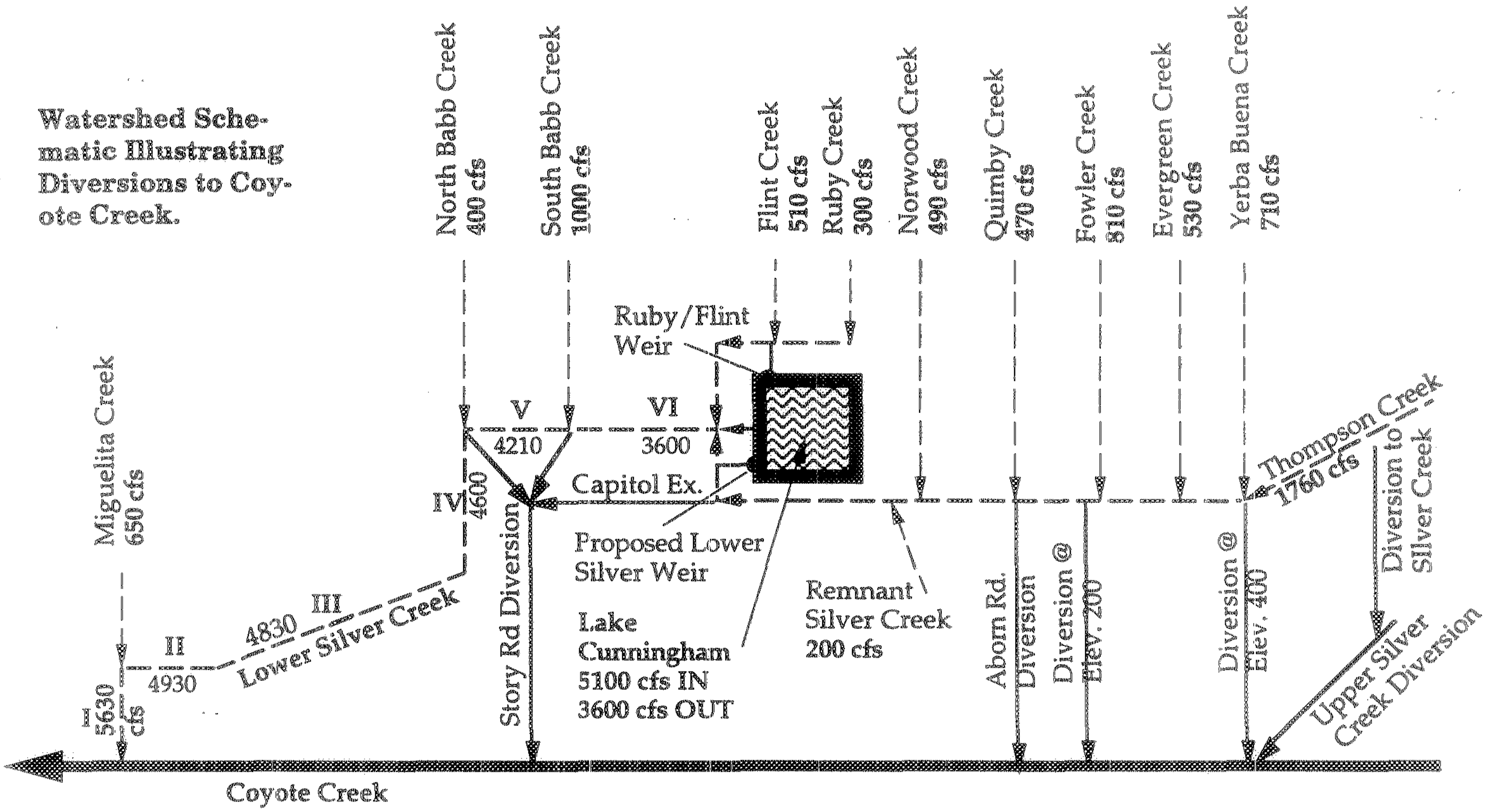
Additional detention structures were investigated to further decrease peak flows in Lower Silver Creek. These structures would supplement the city, county and privately installed measures. Additional basins could be constructed to provide greater flood reduction benefits. Shallow basins could be located in open spaces such as parks and parking lots. Recreation and parking facilities could be reconstructed within the basins. The depth of the basins would be 4 to 6 feet deep to allow a low rate of discharge into the existing storm drain system.

These basins are more expensive to construct compared with the upper watershed basins. Replacing existing parks and parking lots would be an additional cost that is not incurred with upper watershed basins. Additionally, all required storage is generated from excavation that must be disposed of off site and becomes less economical than cut/fill embankments as is demonstrated for the upper watershed basins described previously.

Additional project benefits would be reduced from that described in the 1983 EIS/EIR due to loss of business while parking lots are flooded or draining. This inconvenience may also be unacceptable to the public. For these reasons, lower watershed detention basins were considered secondary in priority to the upper watershed structures.

The hydraulic analysis for the upper watershed basins did show that additional basins would be needed to reduce the flood flows below the existing capacity of Lower Silver Creek. Since the costs per acre/foot of storage for these structures is clearly greater than the Upper Watershed Flood Detention Structures, no cost analysis was performed.

P) Diversion structures for floodwater:
We evaluated various diversions from the Lower Silver Creek watershed directly to Coyote Creek in turn greatly reducing peak flows into Lower Silver Creek. See **Schematic below:**


Watershed Schematic Illustrating Diversions to Coyote Creek.

At the present time, Coyote Creek channel capacity is also below the 100 year level. However, since the hydrographs from Lower Silver Creek are lower and occur sooner than that for Coyote Creek, Coyote Creek's capacity is not a problem. If any of these diversions proved feasible, the impact of advancing peak Thompson flows on Coyote Creek would be analysed in detail.

Eight diversion scenerios were investigated:

- **The Evergreen Canal.**
- **Thompson Creek Diversion along the 400 ft. contour.**
- **Thompson Creek Diversion along the 200 ft. contour.**
- **Thompson Creek Diversion to Upper Silver Creek.**
- **Capitol Expressway, Story Road and Thompson Diversion @400.**
- **Enlarged Capitol and Story Road Diversions.**
- **South Babb Diversion and Lower Silver Creek channel enlargement .**
- **Thompson Creek Diversion with floodways on Aborn and Story Roads.**

The diversions were sized to divert the maximum flow available at the diversion inlet necessary to reduce downstream flows below the existing channel capacity. A minimum of 5 cfs would remain in Lower Silver Creek to maintain wetlands within the existing channel.

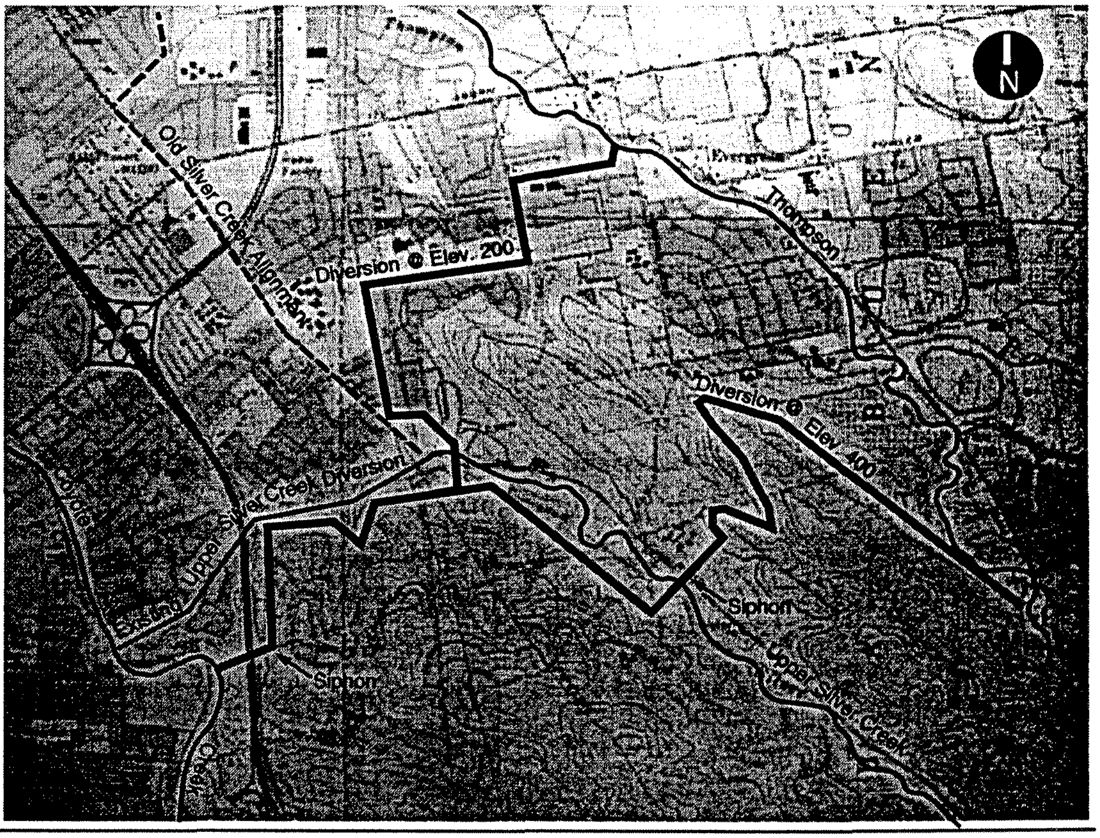
Evergreen Canal

The existing Evergreen Canal was examined as a possible route for diversion of flood water from Thompson Creek to Coyote Creek. The Evergreen Canal was constructed in the 1950's to convey water from Anderson and Coyote reservoirs to Thompson and Silver Creeks for groundwater recharge. The recharge program proved unsuccessful so the canal was reconfigured into an irrigation water delivery system for agriculture. By 1965, urbanization began rapidly displacing agriculture causing a decrease in the need for irrigation water. Due to the decrease in need and damaging landslides, agriculture water delivery through the canal was stopped in 1988. The Santa Clara Valley Water District is presently dismantling the system.

The canal approaches Thompson Creek near elevation 500, where approximately 1760 cfs of flow could be intercepted during the 100 year event. The canal then heads westward along contour elevation 500. There are presently no connections to Thompson or Coyote Creeks. The major problem with using the canal for flood conveyance is that the canal is sloped in the wrong direction. It would not be possible to convey water from Thompson Creek to Coyote Creek in the canal. Since the canal cannot be used, we investigated the option of constructing a new channel near the canal.

Thompson Creek Diversion @ Elev. 400

A diversion channel from Thompson Creek at elevation 400, where a potential maximum flow of 1,735 cfs could be intercepted, was considered. A diversion at this location could consist of 4.8 miles of open earth channel that would follow the contour in a southwest direction towards Coyote Creek. The potential right-of-way is located primarily in a non-native annual grassland and a Serpentine Bunchgrass community, a plant community with a high priority for protection. There is potential and known presence of ten plant species of concern in the area. The site is also in an archaeological sensitive area.



Conceptual Diversions from Thompson to Coyote Creek along elevations 400 and 200.

Note the old alignment of Silver Creek.

The Thompson Creek Diversion would also require the construction of a concrete siphon under Upper Silver Creek, Silver Creek Road and a box culvert under Highway 101.

Thompson Creek Diversion @ Elev. 200
A diversion channel from Thompson Creek at elevation 200 where a potential maximum flow of 2,900 cfs could be intercepted was considered. Interception at this point would allow us to add the flows of Yerba Buena, Evergreen and Fowler Creeks to Thompson's flows.

A diversion at this location could consist of 3.0 miles of earth and concrete surface channels and buried concrete culverts under neighborhood streets. Siphons would also need to be constructed under Upper Silver Creek, Silver Creek Road and a concrete box culvert under US Highway 101. This measure would be very difficult technically and very expensive due to the underground construction and large amount of utility relocations.

Thompson Creek Diversion to Upper Silver Creek
We investigated a variation of the Thompson Creek Diversions that would divert Thompson flows to Upper Silver Creek instead of Coyote Creek. Upper Silver already flows to Coyote Creek and the distance from Thompson to Upper Silver is much shorter. Siphon structures under Upper Silver and Highway 101 would not be required.

The major limitation of this scenerio is that Upper Silver Creek capacity is inadequate. As the area bounded by the Bayshore Freeway, Silver Creek Road and Capitol Expressway was being developed, Upper Silver Creek was diverted through a new earth channel and concrete culvert to Coyote Creek. The culvert under the highway was sized only for the flows from Upper Silver. It is greatly undersized for any additional flows. The culvert is under 8 lanes of asphalt with a median and soundwalls. It is possible but very expensive to enlarge. There have been proposals by developers to enlarge the culvert in exchange for new development rights in the upper watershed. However, their proposals were turned down by the county.

Capitol Expressway, Story Road and Thompson (@ 400) Diversions to Coyote Creek
We investigated flood flow diversions from Lower Silver Creek at the vicinity of Lake Cunningham and at the intersection of North Babb and Lower Silver. In this scenerio, Lower Silver Creek would not have to be enlarged in any of it's six reaches.

The diversions at Lake Cunningham and North Babb Creeks would be underground concrete box culverts. Their alignment would follow Capitol Expressway and combine at Story Road. A larger box would be constructed under Story Road to an outlet at Coyote Creek. Major traffic thoroughfares were selected for the alignment due to the generally direct route, wider available right of way and reduced impacts from construction in residential neighborhoods. A difficult transition point exists where Story Road crosses over Highway 101. The culvert would probably have to be tunneled under the highway. An open earth channel diversion at Thompson would still be required.

Enlarged Capitol and Story Road Diversions.

This scenerio investigates concrete box culverts from Lake Cunningham and North Babb Creeks and followed the same route as the culverts above. These culverts were larger however due to the absence of the Thompson Creek Diversion.

South Babb Diversion and Lower Silver Creek channel enlargement

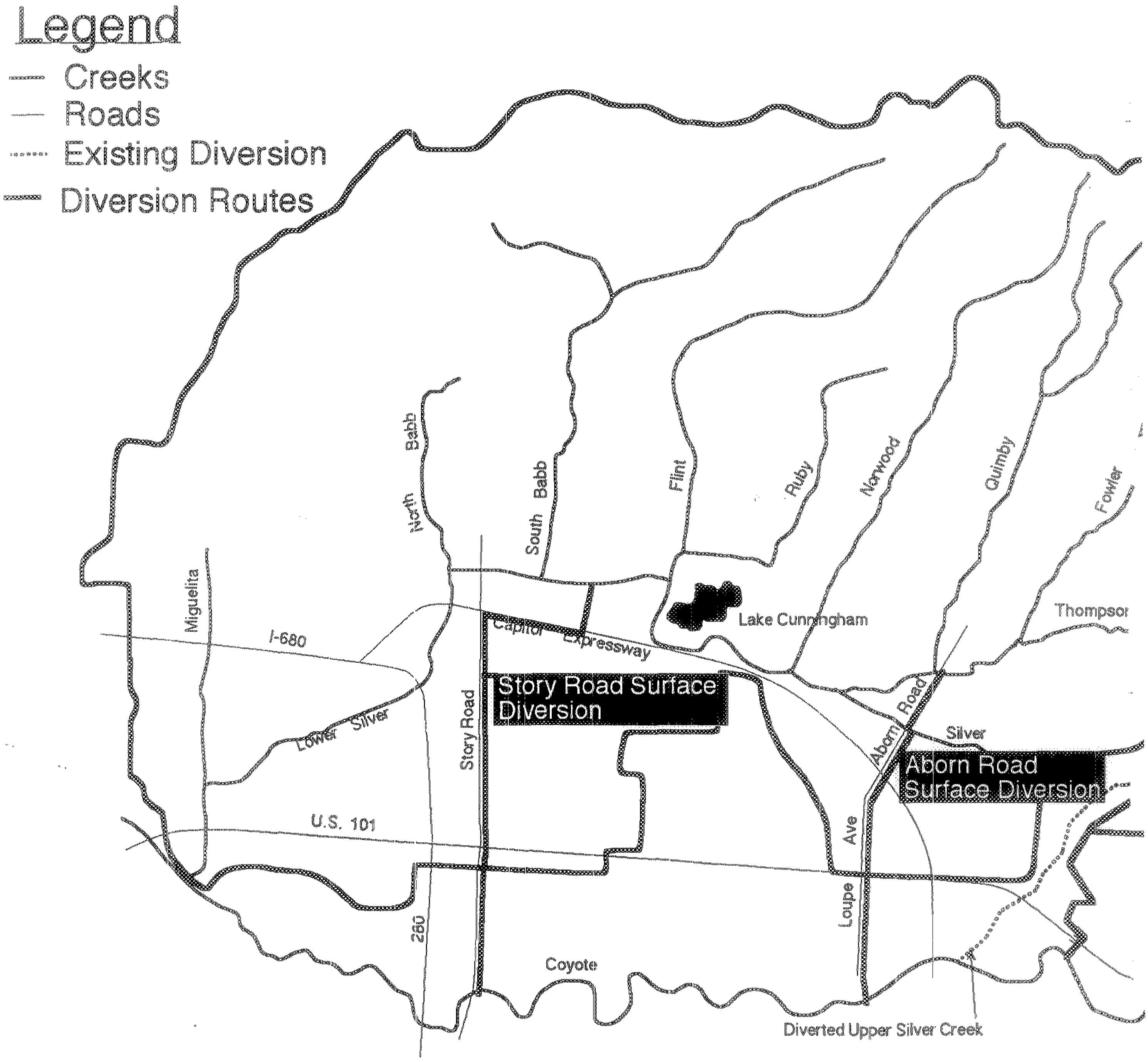
This scenerio investigates a diversion from South Babb constructed under Story Road to the intersection with Coyote Creek, a distance of about 2.7 miles. The flood flow at this point is 4210 cfs.

The channel capacity for Lower Silver Creek for Reach 6 is inadequate to convey the design flows and would be enlarged within the existing right-of-way. The enlarged channel would have 1:1 side slopes and be lined with pre-cast, concrete blocks to allow vegetation to be established within the channel for that reach.

Thompson Creek Diversion with floodways on Aborn and Story Roads

This scenerio includes the Thompson Creek Diversion at elev. 400 as previously described plus depressed surface streets along Aborn Road and Story Road that would be designed to deliver flood flows to Coyote Creek. The flooded roads were assumed to have adequate right of way to provide for the construction of a shallow flood channel that could be passable by emergency vehicles during a flood event. The maximum depth was assumed to be 18 inches. It should be noted that the project benefits would be lower than that for the recommended plan in the EIS/EIR due to the loss of business within the affected areas. The public and public agencies are extremely opposed to this type of flooding.

Thompson & Surface Road Floodways



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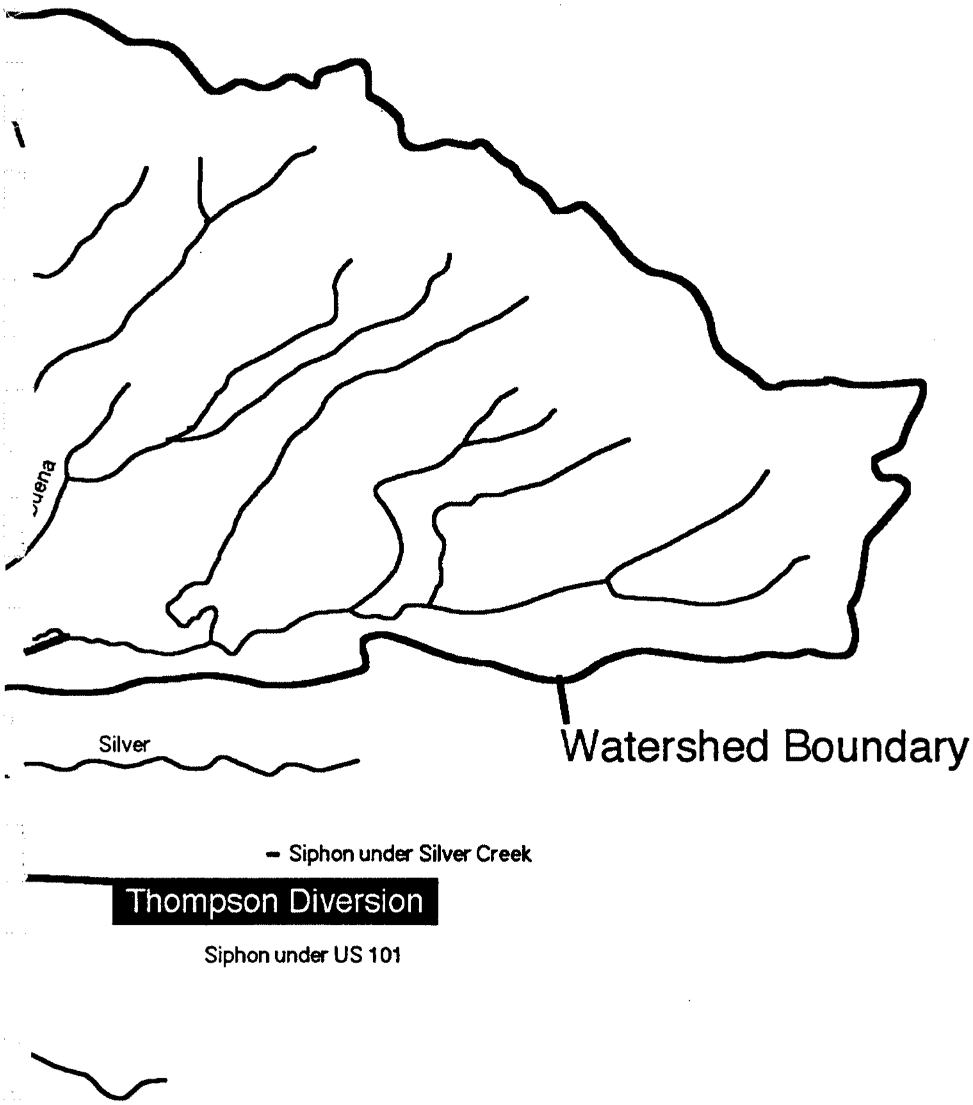

~uena
Silver
Watershed Boundary
Siphon under Silver Creek
Thompson Diversion
Siphon under US 101

Q) Soil Bioengineering measures:

Soil Bioengineering measures have been used for decades as a low cost method to reduce erosion, stabilize streambanks and restore riparian habitat. It combines mechanical, biological and ecological concepts requiring an interdisciplinary design approach to create environmentally sensitive solutions for streambank stabilization. It is an applied science that utilizes woody species that can root from cuttings to create a living structure. Initially the arrangement of the cuttings provides mechanical protection for the slope. As the plants grow, the roots reinforce the soil from erosive flows and allow other species to volunteer and create a self-sustaining community. These measures also improve infiltration, filter runoff and enhance esthetics.

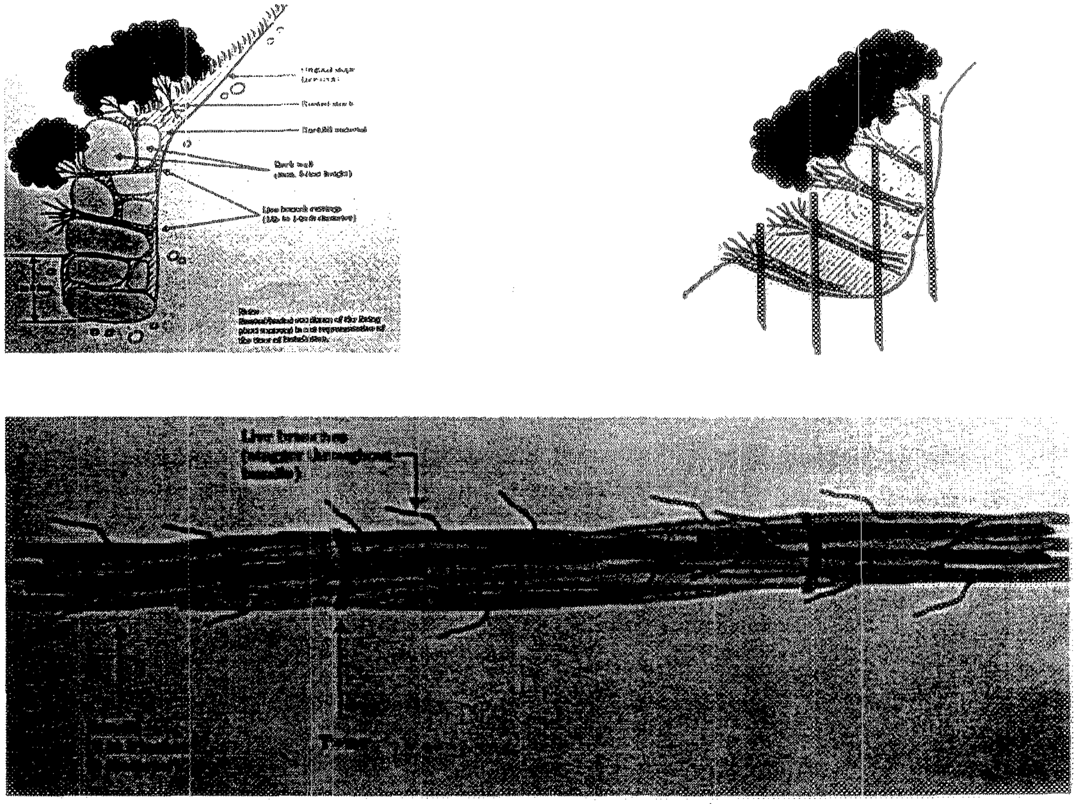
We investigated numerous techniques as independent measures:

- **Live Staking**
- **Brush Mattresses**
- **Brush Layering**
- **Fascines**
- **Branch Packing**

We also investigated combining the above with other slope reinforcement methods:

- **Log Cribwalls**
- **Joint Plantings in the voids of riprap**
- **Vegetated Rock Gabions**
- **Vegetated Rock Walls**

Most of the above measures can be utilized throughout the Lower Silver project to stabilize and protect the channel banks. However, the fundamental problem of the lack of channel capacity within the existing right-of-way prevents using these measures exclusively. Upstream detention would be required. Except for the log cribwall measure, we did not estimate a project cost.



Joint Plantings, Branch Packing and Willow Fascines

Log cribwalls were examined as a possible bank reinforcement measure. Combined with live cuttings of woody plant species, log cribwalls can provide both structural integrity and wildlife value. As the cuttings root and grow to trees and shrubs, the combined root mass and log cribwall can grow stronger with time.

The design team requested that log cribwalls be investigated due to their construction on several local streams. Strawberry Creek, as it crosses the U.C. Berkeley Campus, and a stretch of Castro Creek in Alameda County both utilize log cribwalls with interspersed plantings as bank stabilization and riparian habitat improvement. Strawberry Creek has become a local model for stream and riparian habitat restoration.

Strawberry Creek encompasses a watershed area of approximately 369 acres, 40% of which is urbanized. Lower Silver Creek's watershed area has 27,700 acres of which 70% of the watershed is urbanized. The greatest difference between the two creeks is their 100 year flood flows: Strawberry's estimated flow is 430 cfs with inlets carefully controlled while Lower Silver's estimated flow is 5630 cfs with very little inlet control.

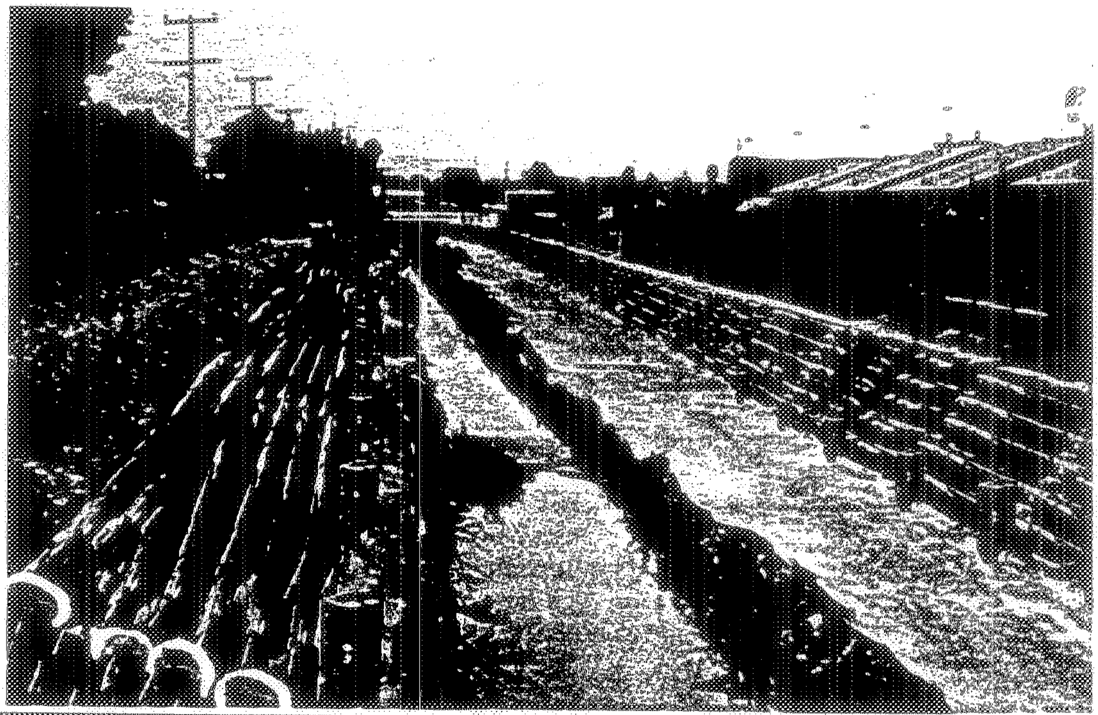
Existing Strawberry Creek Log Cribwall @ U.C. Berkeley Campus

The flows for Lower Silver Creek are high and scour is a concern in flood conditions. Log cribwalls with willow cuttings would protect the banks against scour and provide habitat, however they would increase the Manning's "n" value for wall roughness to a value greater than 0.050. This value would not allow the required 100 year flood flow in any channel that could be constructed within the existing right-of-way. There would not enough flood control benefit unless it were used in conjunction with diversion and/or detention measures.

The cost for installing log crib walls is comparable to the installation at Castro Creek. Alameda County is constructing walls of 4 to 5 feet in height on both sides of the creek with costs that average $1000 per lineal foot. Lower Silver Creek would require walls between 10 to 14 feet. Costing about $2500 per linear foot, the total project cost for the construction of the log cribwalls would be approximately $61.4 million.

Another issue in using log cribwalls is the environmental impact that would occur in harvesting the quantity of logs required for the project. We estimated the number of acres of trees needed for the project. At the minimum, 206 acres of redwoods would have to be harvested to provide enough logs for Lower Silver.

Existing View of Reach 5.



Computer Simulation of Log Cribwall Installation at Reach 5, before vegetation installation.

R) Floodproofing restudy:

We reviewed the original floodproofing alternative in the original 1983 workplan and investigated several new variations. A feasible non-structural plan could not be developed that would protect every building in the floodplain. Therefore, criteria was developed that divided the floodplain into 50 zones of similar structures. Costs and benefits of providing each zone with protection were evaluated. If a zone had net positive benefits, then all structures in that zone were protected using various nonstructural measures. If a zone did not have net positive benefits, only some structures or no structures would have flood protection.

This alternative would include the following measures to reduce flooding:

1) Perimeter walls
2) Protective walls
3) Elevation of residences
4) Relocation of residences
5) A flood warning system

Floodproofing individual properties would involve the construction of perimeter walls around 5 commercial and industrial properties, elevating 35 residences, and installing protective walls around 157 buildings. One-way sewer valves would be installed in conjunction with these measures and all low-level enterances and windows would be equiped with portable floodshields in the buildings protected by perimeter and protective walls. All landscaping disturbed during installation would be replaced or repaired. Ten residences would be relocated to areas outside the floodplain which would require the aquisition of 1.7 acres for the relocation.

The floodwarning system would consist of a system of gauges on Thompson Creek and Lake Cunningham, and a warning system to alert residents with protective or perimeter walls around their properties to install the portable floodshields.

Operation and maintenance of this alternative would involve a program of education, inspection, upkeep, and replacement of the protective measures. Community cooperation would be difficult to accomplish due to relocation requirements or structural alterations to residences.

This measure was rejected due to the high annual operation and maintenance costs and high remaining annual damages. Many areas would not be protected from flooding and some areas would only receive minimal protection.

S) Geomorphic Stream Restoration:
We investigated a geomorphic approach to restoring Lower Silver Creek. The approach essentially requires the analysis of the watershed's condition, stream dynamics, community types, stream size, velocity, sinuosity, stream gradient, stability, bank slope, uniformity and stratigraphy. Existing and desired fish and wildlife habitat, water quality and esthetic and recreational values must be determined.

The basic stream geometry requires a base flow channel sized to carry the approximately two year discharge. The base flow channel would be restored to the sinuosity of it's former alignment (before straightening and development in the watershed). The gradient is restored to the level that insures the proper velocities and sediment transport and deposition. Natural channel geometry along with shelters and overhanging vegetation are designed in to restore viable fish habitat. The base flow channel is configured to meander in a floodplain that is adequately sized to carry the stream's flood flows and handle the associated sediment deposition. By careful design, and the use of natural materials, many of these components can be induced to form on their own and not need to be constructed.

In the case of Lower Silver Creek, without upstream detention, the basic geomorphic configuration would be:

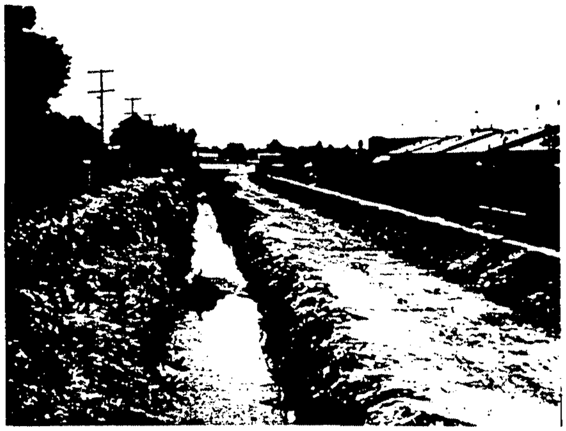
- The Base Flow channel would be sized for the approximately two year flow of from 700 cfs in Reach 6 to 1340 cfs in Reach 1. A 2.2 foot depth flow at an average velocity of 4.5 feet per second would require the base flow channel bottom width to be 60' wide, nearly the width of the presently existing right-of-way! It's meander length would have to double.

- The floodplain required would be approximately 200' to 300' wide, much greater than the presently existing right-of-way. Re-creating a floodway for Lower Silver Creek would require the purchase and demolition of approximately 300 homes, 150 apartment units and several commercial and industrial buildings on one or each side of the existing right-of-way for the entire length of the creek.

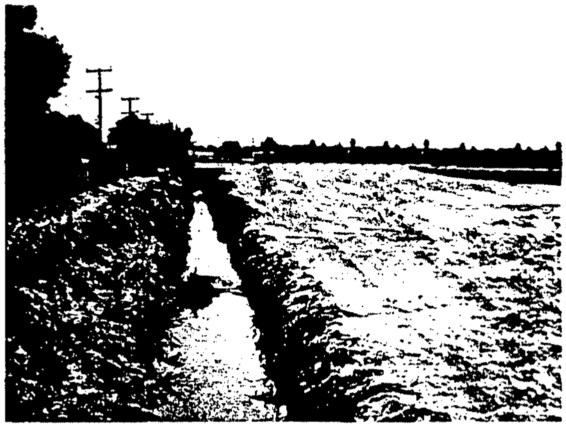
- The riparian corridor could be developed via soilbioengineering techniques.

This measure was rejected since it would cost upwards of $220,000,000. (not including any bridge replacement costs.) Even though this measure is not feasible, we applied some of the elements of this approach to the "Ideally Restored" measure described on page 34.

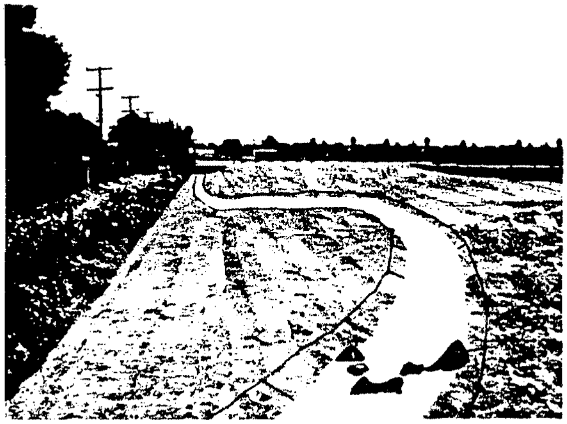
Photo looking upstream along Lower Silver Creek, Reach 5.



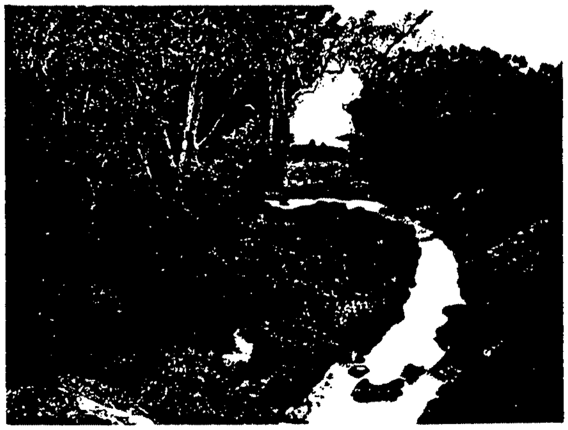
Simulation illustrating the removal of houses, apartments and other buildings to recreate Lower Silver Creek's original 300' wide floodplain.



Simulation illustrating the re-creation of meandering low flow channel.



Simulation illustrating riparian corridor along the re-created meandering low flow and widened floodplain.



Appendix B

NEW ALTERNATIVES ANALYSIS

Three new alternatives were developed by combining flood reduction measures that would provide 100 year level protection, reduce the amount of concrete channel proposed in the 1983 plan and mitigate damages to wetlands, riparian habitat and the fishery. The team proposed the following alternatives:

Alternative #4, Geomorphic stream restoration with a series of upper watershed detention basins:

As we previously mentioned, we investigated the option of restoring the existing disturbed earthen and concrete lined sections of Lower Silver Creek that exist downstream of Lake Cunningham. The advantages would include: providing a linear riparian corridor with areas of open water and wetland habitat, reducing the sediment loading by eliminating current bank failures, planting vegetation in the channel invert along the low flow channel and providing a scenic green corridor to visually seperate neighborhoods, act as a windbreak and provide shade. **See Page 34.** The channel would remain earth, however, it would be widened to within the maximum extent of the existing right-of-way. The existing concrete lined sections would be removed. The estimated construction cost including mitigation is approximately $7.8 million.

The disadvantage of this option is that the large amount of vegetation in the channel reduces the channel's flood capacity to below its present capacity. To reduce the peak flows, we added the upper watershed basins **(Page 42)** to the alternative in order to detain enough of the flood flows to allow the restored Lower Silver Creek to function with it's reduced capacity. The upper watershed basins would cost $129.5 million. This alternative is technically feasible, however, with a combined cost exceeding $157 million, the alternative is economically unfeasible.

Alternative #5, Geomorphic stream restoration with a Thompson Creek Diversion Channel:

We then combined the Ideal Creek Restoration measure with a Thompson Creek diversion channel as an alternative. The diversion channel would have the potential to intercept @ 1,735 cfs of flood flows from Thompson Creek and divert it directly to Coyote Creek. This includes:

- 4.8 miles of earth channel from Thompson Creek to Coyote Creek at elevation 400.
- 1,200 lf of reinforced concrete siphon 12' high by 24' wide beneath Upper Silver Creek.
- 200 lf of concrete box culvert under US 101 and outlet to Coyote Creek.
- Channel modifications to Lower Silver would be required:
    - Reach 2 - trapaziodal concrete lining
    - Reach 4 - hybrid block channel lining
    - Reach 5 - hybrid block channel lining
    - Reach 6a - hybrid block channel lining

The diversion is technically feasible, however, other related technical factors have eliminated this alternative from consideration: Not enough flood flow could be diverted to allow the restored creek to convey the remaining flows from the watershed. The alignment for the diversion is near the Silver Creek Fault in an area of landslides. Coyote Creek has a capacity problem at the point where the diversion from Thompson would enter.

If we increased the capacity of Lower Silver and could overcome the seismic hazard, Coyote Creek enlargement would be required to make this alternative work. We would not be able to restore much of the Lower Silver Creek habitat and we would be damaging the much higher value riparian and wetland habitat along Coyote Creek It is estimated to cost $27.8 million not including mitigation costs.

Alternative #6, A vegetated hybrid block wall channel with the environmental elements of the Geomorphic alternative, with earth and concrete lined channels, constructed within the existing right-of-way:

This alternative is a blend of elements from the "Ideal Restoration" concept and elements from the original 1983 workplan. The capacity of the existing channels are increased by excavation within the existing right-of-way. Approximately 143,000 cubic yards of excavation would be required. Several types of channel treatments are proposed:

- 0.93 miles of multi-stage earth channel with low flows shaded by trees and shrubs planted in the invert and along the sideslopes and top of banks.
- 0.57 miles of architecturally treated trapezoidal concrete lining and 0.25 miles of architecturally treated rectangular concrete lining in areas where right-of-way is very narrow.
- 2.15miles of vegetated hybrid concrete block channel with earth of earth covered riprap bottoms and trees and shrubs planted in the invert, vines and shrubs planted in between blocks and trees and shrubs along the tops of banks.

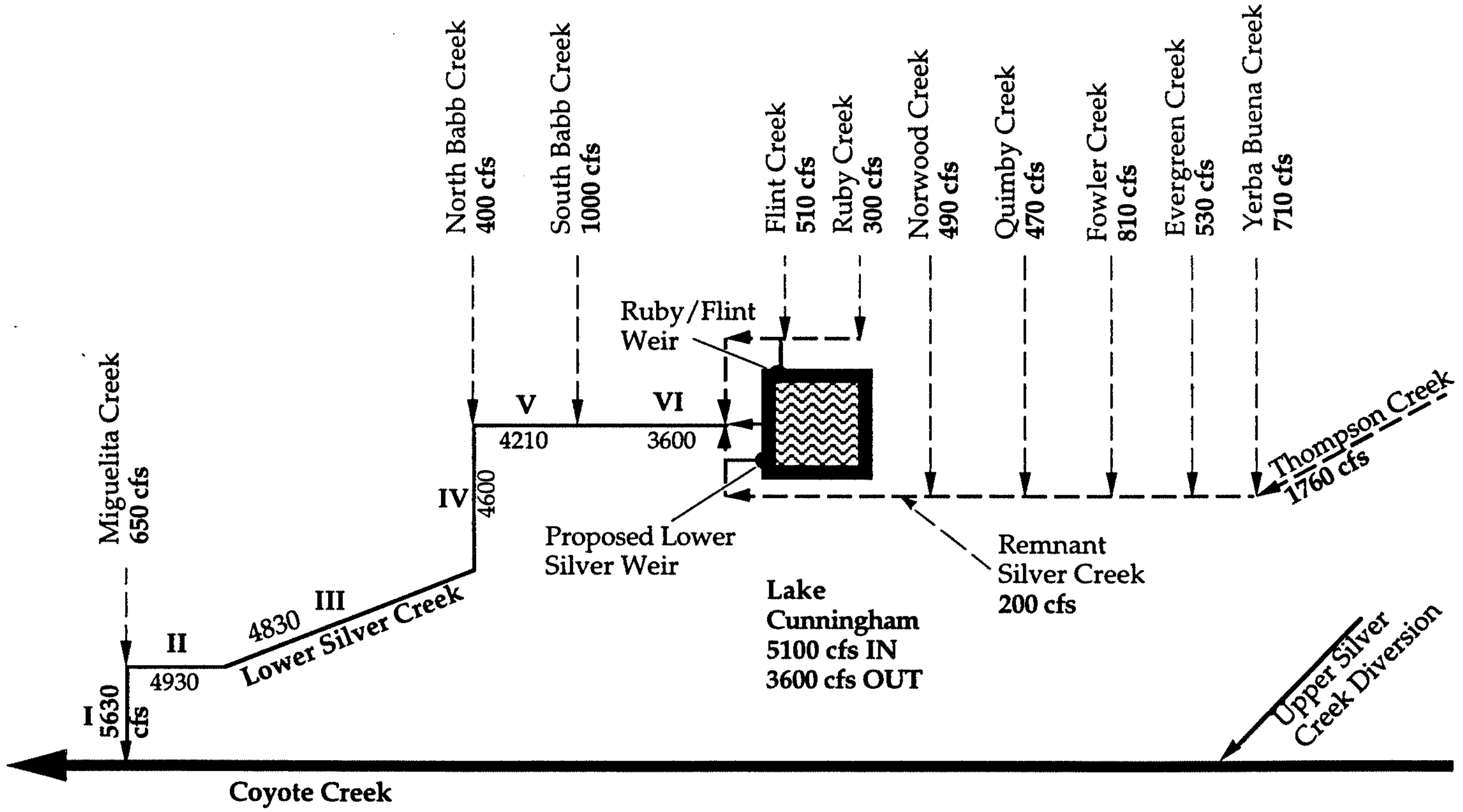
This alternative was chosen as the **"1998 Recommended Plan"** with an estimated cost of $29,491,275 and a Benefit/ Cost Ratio of 1.04. **See Appendix K.**

Verification of Original Watershed Hydrology

The NRCS Unit Hydrograph Model "TR-20" was used to develop Lower Silver Creek's hydrographs, flow routings and future expected flows at various points in the watershed. A "hydrograph" is a graph showing instantaneous stream discharge as a function of time for each watershed subarea. The hydrographs take into account the effects of climate, hygrologic losses, surface runoff, interflow, and groundwater flow. These hydrographs are then routed overland or through stream channels. The following local information was used to calculate the hydrograph:

- 24-hour precipitation
- Curve Number (a runoff factor)
- Time of Concentration (time it takes for water to travel the length of the watershed)
- Storm pattern type.

The 24-hour precipitation was obtained from precipitation maps published by the National Weather Service. The 24-hour precipitation was best represented by NRCS's standard storm distribution type IA, a storm pattern which reflects the gentle Pacific storms of Northern California. The Curve Number (CN) for the "natural" condition was adjusted so that the runoff volume matches that from the SCVWD equations with the "Los Alamos Adjustment Factor". The Time of Concentration was then adjusted so the peak flows for the natural watershed were matched by the TR-20 hydrograph model for each watershed subarea.



Lower Silver Creek Watershed Schematic
100 Year Peak Discharges Shown

Los Alamos Adjustment Factor

The Santa Clara Valley Water District developed a set of flow-frequency equations based on flow measurement observations along streams in Santa Clara County. These equations are based on the analysis of 37 stream gauges using standard statistical procedures. Based on joint research by SCVWD and the Corps, an adjustment factor, referred to as the "Los Alamos Adjustment Factor", is used by SCVWD to reduce the peak volume calculated from the regional equations by 0.82 and the peak flows by a factor of 0.80. This procedure was used to develop projected peak flows and volume for each subarea in its "natural" or "undeveloped" condition.

The next part of the model accounts for urbanization. Future land use data was obtained from the General Land Use Plan prepared by the City of San Jose. The land uses were divided into nine classifications. The amount of impervious area was calculated for each subwatershed. A hydrograph was then generated for the "natural" and "urbanized" area for each subwatershed. The two hydrographs were then added together. The resultant hydrograph was then routed through an urban flood storage function. This function accounts for ponding that takes place on the streets as water backs up to enter the storm sewer system. Other surface ponding is also accounted for.

Other Studies

The USGS has developed a series of regression equations to estimate the flow-frequency for watersheds. For Lower Silver Creek, the peak flow using the USGS equation is estimated at 7,200 cfs compared to 5,630 cfs obtained by using the NRCS TR-20 model. Most of the difference between the two models is due to the fact that the USGS equations do not consider the effect of the urban flood storage function.

The SCVWD has developed a hydrologic model for the Coyote Creek watershed which includes Lower Silver Creek. This model predicts a 100-yr flow of 5,500 cfs on Lower Silver Creek at the outlet into Coyote Creek. The US Army Corps of Engineers has studied and adopted the SCVWD hydrology. The Corps is using the SCVWD's hydrology in their analysis of the Coyote Creek flood problem.

Q_{100}, Q_2

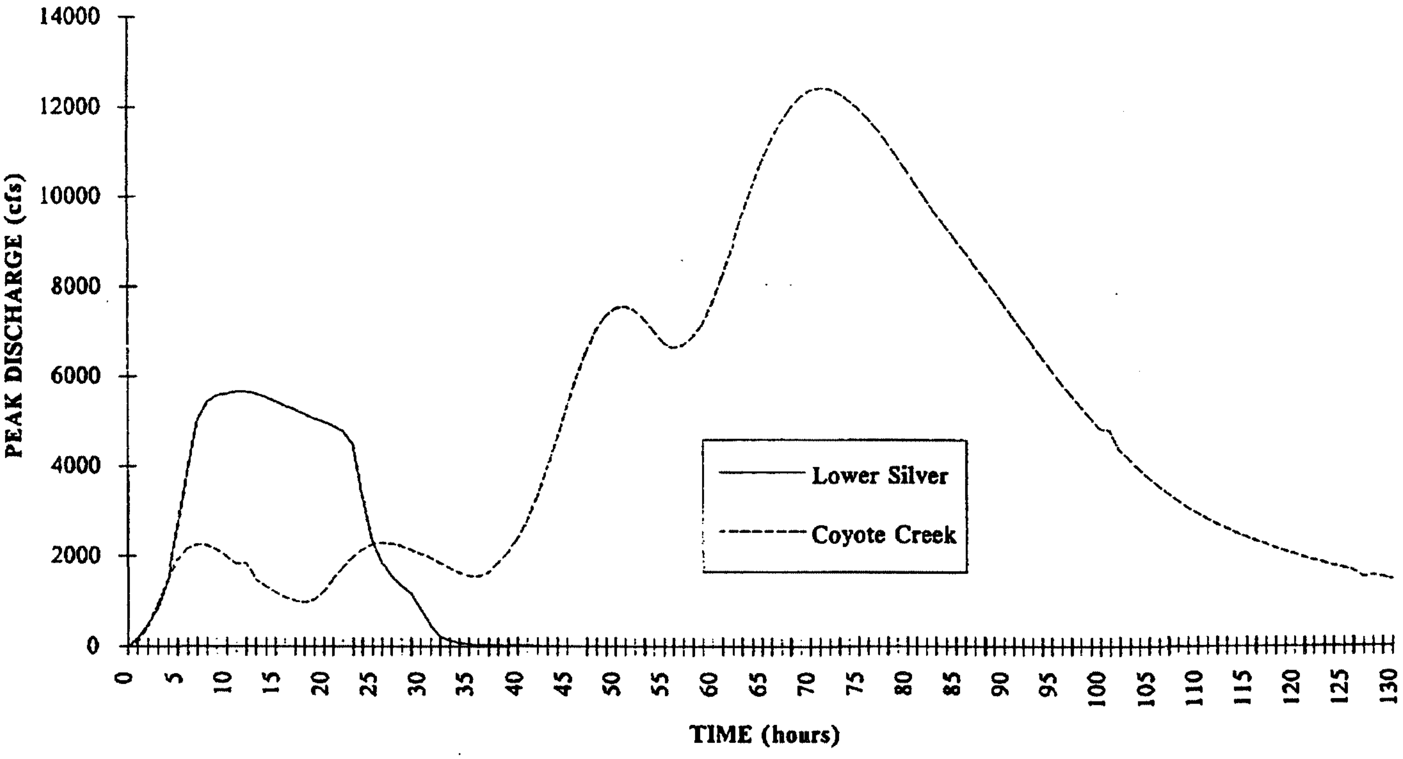
Since a re-analysis of the hydrologic data only produced a very slight variation from the preliminary data presented in the 1983 plan, and since the various hydrology models by the different agencies generally agree, we used the current TR-20 100 year Peak Flow of 5,630 cfs and the 2 year Base Flow of 1,340 cfs to study the various alternatives.

Downstream Impacts

Coyote Creek drains a total area of 249 square miles above the confluence with Lower Silver Creek and 365 square miles at its outlet into San Francisco Bay. The highest recorded flow on Coyote Creek was 25,000 cfs in March of 1911, measured at the stream gauging station near Madrone. Since then, two water supply reservoirs have been constructed: Coyote Dam in 1936 and Anderson Dam in 1950. These two reservoirs provide a significant amount of flood storage since they are not completely filled prior to the flood season. Due to this storage, the flood peaks on Coyote Creek have been greatly reduced. The highest recorded flow on Coyote Creek since 1950 is 5750 cfs. Downstream from Lower Silver Creek, Coyote Creek travels for 18 miles before it flows into south San Francisco Bay. Along the way it picks up water from it's tributaries Upper Pencitencia Creek, Lower Penitencia Creek and Berryessa Creek.

Increasing the capacity of Lower Silver Creek will have a minimum effect on the peak flows and volumes in Coyote Creek. The peak flows from Lower Silver Creek arrive at Coyote Creek before the peak flows from the main portion of the watershed. **See Time of Concentration Graph**. The work on Lower Silver Creek will not change this relationship or induce additional flooding on Coyote Creek.

Time of Concentration Graph



SECTION 404 PERMIT

The US Army Corps of Engineers (Corps) notified the Santa Clara Valley Water District (SCVWD) that it had received objections to the issuance of the 404 permit for the Lower Silver Creek project. The Corps instructed the SCVWD to work with the lead agency the USDA/ Natural Resources Conservation Service (NRCS), other sponsors, agencies and individuals to overcome their objections and concerns about the project. If resolution to all the issues could be reached and an alternatives analysis and mitigation plan is submitted, the Corps agreed to continue processing the application to completion. The SCVWD asked the NRCS and GCRCD to assist in the updating of the 1983 plan. NRCS agreed to lead the design team.

The list of agencies responding to the Corps 404 Permit:
- California Regional Water Quality Control Board
- U. S. Environmental Protection Agency
- California Resources Agency
- California Department of Fish and Game
- Department of Transportation-Division of Structures
- Department of Transportation-CalTrans
- U.S. Fish and Wildlife Service
- National Marine Fisheries
- California Archaeological Inventory
- Santa Clara County Health Department
- California Waterfowl Association
- County of Santa Clara, Parks and Recreation Department

Summary of Responses to the Corps Public Notice:
1. *Objection to a net loss of acreage of wetland and riparian habitat.*

2. *Objection to a lack of a detailed mitigation plan for the losses of wetland and riparian acreage and impacts to fisheries. The general mitigation plan in the 1983 plan as summarized in the Corps Public Notice was not of sufficient detail.*

3. *It was felt that the project would alter the flow regime and degrade the ecosystem. The widened channel would lower velocities and increase temperatures. It would adversely impact the existing fishery, avian community, water quality and vegetation of Silver Creek.*

4. *Contention that the project as proposed was not justified against other alternatives which could be more environmentally acceptable.*

5. *There is a need to apply for a water quality certification from the Regional Water Quality Control Board, San Francisco Bay Region.*

6. *Objection to the project impacts to existing fishery resources:*
   - *The project would exclude the possibility of restoring anadromous fisheries including Steelhead to Lower Silver Creek.*
   - *The 5.1 foot drop would exclude steelhead migration.*
   - *Recommendation that the project should offset the impacts of previous channel modification by creating spawning and rearing habitat and the construction of a low flow suitable for migratory fish passage.*

7. *Need to evaluate potential for archaeological resources in the project area.*

8. *Concern about increased risk for mosquito breeding.*

9. *Concern about impacts to a proposed public use trail corridor along the Lower Silver Creek Project.*

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Sacramento Field Office
2800 Cottage Way, Room E-1803
Sacramento, California 95825-1846

In Reply Refer To:
1-1-94-SP-694

April 12, 1994

Mr. Henry C. Wyman
Acting State Conservationist
Soil Conservation Service
2121-C Second Street
Davis, California 95616

Subject: Species List for Proposed Lower Silver Creek Watershed Project, San Jose, Santa Clara County, California

Dear Mr. Wyman:

As requested by letter from your agency dated February 24, 1994, you will find enclosed a list of the proposed endangered and threatened species (Enclosure A) that may be present in the subject project area. To the best of our knowledge no listed species occur within the area. The list fulfills the requirement of the Fish and Wildlife Service to provide a list of species under Section 7(c) of the Endangered Species Act, as amended (Act). Please see Enclosure B for your requirements.

Upon completion of the Biological Assessment (see Enclosure B), should you determine that a proposed species may be adversely affected, then you should consider conference proceedings, pursuant to 50 CFR § 402.10, with our office. One of the benefits of a conference to the consulting agency is to provide the necessary planning alternatives should a proposed species become listed before completion of a project.

Also, for your assistance, we have included a list of candidate species. These species are presently being reviewed by our Service for consideration to propose for possible listing as endangered or threatened. Candidate species have no protection under the Endangered Species Act and are included for your consideration as it is possible the candidates could become formal proposals and be listed during the construction period. Should your assessment reveal that candidate species may be affected, then you should consider requesting technical assistance from our office. One of the benefits of technical assistance is to provide the necessary planning alternatives should a candidate species become listed before completion of a project.

If the Biological Assessment is not initiated within 90 days of receipt of this letter, you should informally verify the accuracy of this list with our office.

Should you have any additional questions regarding this list or your responsibilities under the Act, please contact Laurie Stuart Simons at (916) 978-4866.

Sincerely,

Cay C. Goude

Dale A. Pierce
Acting Field Supervisor

Enclosures

ENCLOSURE A

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CANDIDATE SPECIES THAT MAY OCCUR IN THE AREA OF THE PROPOSED LOWER SILVER CREEK WATERSHED PROJECT, SAN JOSE, SANTA CLARA COUNTY, CALIFORNIA

(1-1-94-TA-694, APRIL 12, 1994)

Listed Species

None

Proposed Species

Amphibians

California red-legged frog, *Rana aurora draytonii* (PE)

Candidate Species

Amphibians

California tiger salamander, *Ambystoma californiense* (2■)
California red-legged frog, *Rana aurora draytonii* (PE)
foothill yellow-legged frog, *Rana boylii* (2)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (2)
southwestern pond turtle, *Clemmys marmorata pallida* (2)

Birds

loggerhead shrike, *Lanius ludovicianus* (2)

Mammals

San Francisco dusky-footed woodrat, *Neotoma fuscipes annectens* (2)
Pacific western big-eared bat, *Plecotus townsendii townsendii* (2)
greater western mastiff-bat, *Eumops perotis californicus* (2)

Plants

Mt. Hamilton thistle, *Cirsium fontinale* var. *campylon* (2)
South Bay clarkia, *Clarkia concinna* ssp. *automixa* (2)
northcoast bird's-beak, *Cordylanthus maritimus* ssp. *palustris* (2)
Hoover's button-celery, *Eryngium aristulatum* var. *hooveri* (1)
Contra Costa goldfields, *Lasthenia conjugens* (1)
delta tule-pea, *Lathyrus jepsonii* var. *jepsonii* (2)

(E)--Endangered (T)--Threatened (P)--Proposed (CH)--Critical Habitat
(1)--Category 1: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.
(2)--Category 2: Taxa for which existing information indicated may warrant listing, but for which substantial biological information to support a proposed rule is lacking.
(1R)-Recommended for Category 1 status.
(2R)-Recommended for Category 2 status.
(▩)--Listing petitioned.
(*)--Possibly extinct.

ENCLOSURE B

FEDERAL AGENCIES' RESPONSIBILITIES UNDER SECTIONS 7(a) and (c) OF THE ENDANGERED SPECIES ACT

SECTION 7(a) Consultation/Conference

Requires: 1) Federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species; 2) Consultation with FWS when a Federal action may affect a listed endangered or threatened species to insure that any action authorized, funded or carried out by a Federal agency is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. The process is initiated by the Federal agency after determining the action may affect a listed species; and 3) Conference with FWS when a Federal action is likely to jeopardize the continued existence of a proposed species or result in destruction or adverse modification of proposed critical habitat.

SECTION 7(c) Biological Assessment--Major Construction Activity[1]

Requires Federal agencies or their designees to prepare a Biological Assessment (BA) for major construction activities. The BA analyzes the effects of the action[2] on listed and proposed species. The process begins with a Federal agency requesting from FWS a list of proposed and listed threatened and endangered species. The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable). If the BA is not initiated within 90 days of receipt of the list, the accuracy of the species list should be informally verified with our Service. No irreversible commitment of resources is to be made during the BA process which would foreclose reasonable and prudent alternatives to protect endangered species. Planning, design, and administrative actions may proceed; however, no construction may begin.

We recommend the following for inclusion in the BA: an on-site inspection of the area affected by the proposal which may include a detailed survey of the area to determine if the species or suitable habitat are present; a review of literature and scientific data to determine species' distribution, habitat needs, and other biological requirements; interviews with experts, including those within FWS, State conservation departments, universities and others who may have data not yet published in scientific literature; an analysis of the effects of the proposal on the species in terms of individuals and populations, including consideration of indirect effects of the proposal on the species and its habitat; an analysis of alternative actions considered. The BA should document the results, including a discussion of study methods used, any problems encountered, and other relevant information. The BA should conclude whether or not a listed or proposed species will be affected. Upon completion, the BA should be forwarded to our office.

---

[1] A construction project (or other undertaking having similar physical impacts) which is a major Federal action significantly affecting the quality of the human environment as referred to in NEPA (42 U.S.C. 4332(2)C).

[2] "Effects of the action" refers to the direct and indirect effects on an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action.

APPENDIX A - ENDANGERED SPECIES LIST
FEDERAL AND STATE THREATENED, ENDANGERED, CANDIDATE, RARE AND SPECIAL CONCERN SPECIES FOR THE LOWER SILVER CREEK WATERSHED PLAN

Species	Federal	State	Habitat	Locations
Invertebrates				
Bay Checkerspot Butterfly *Euphydryas Editha Bayensis*	Threatened	none	Native grasslands on outcrops of serpentine soil. Host plant - *Plantago Erecta*	Near Silver Creek south of San Jose.
Fish				
Amphibians				
California Tiger Salamander *Ambystoma Californiense*	C1	none	Squirrel borrows, vernal pools in annual grasslands & valley-foothill hardwood understory habitats	Vicinity of Hillsdale Mine, Communication Hill & Yerba Buena Cr. San Jose CA
Reptiles				
Birds				
Mammals				
San Joaquin Kit Fox *Vulpes Macrotis Mutica*	Endangered	Threatened	Annual grasslands or grassy open stages with scattered shrubby vegetation. Need loose-textured sandy soils for burrowing & suitable prey base.	7 miles WNW of Morgan Hill
Plants				
Edgewood Blind Harvestman *Calicina Minor*	C2	none	open grasslands on the underside of moist serpentine rocks near permanent springs	Silver Creek Rd., 5 miles SE of Tully Rd., San Jose, CA
Mt. Hamilton Thistle *Cirsium Fontinale Var Campylon*	C2	none	In seasonal and perennial drainages on serpentine located in cimontane woodland, chaparral, & foothill grassland.	Hyler Canyon,Silver Creek Wetland Mitigation Site adjacent to golf course, etc.
Contra Costa Goldfields *Lasthenia Conjugens*	G1	none	Vernal pools in open valley and foothill grasland areas, up to 700 ft.	West of Capitol Ave. at its junction with Cornwall St., east of Hwy 101, San Jose, CA

STATUS:

E Endangered: Listed as endangered.
Threatened: Listed as threatened.
C1 Candidate 1: Sufficient biological data to support a proposal to list as threatened or endangered.
C2 Candidate 2: Existing information may warrant listing, substantial biological support for listing is lacking.
3C Withdrawn from candidacy for federal listing.
SC Special Concern: California species that has either declined in numbers or its range reduced, population is monitored to see if more study is warrented.

Data from the U.S. Fish and Wildlife Service and the California Natural Diversity Data base. July 21, 1997.

APPENDIX A - ENDANGERED SPECIES LIST
FEDERAL AND STATE THREATENED, ENDANGERED, CANDIDATE, RARE AND SPECIAL CONCERN SPECIES FOR THE LOWER SILVER CREEK WATERSHED PLAN
(PAGE 2)

Species	Federal	State	Habitat	Locations
Plants				
Metcalf Canyon Jewelflower *Streptanthus Albidus SSP Albidus*	Endangered	none	Open areas in dry grassy meadows and roadcuts on serpentine soils, between elevation 400 - 1,000 ft.	4 mi. south of San Jose above Cincas Cr., Serpentine Hills, etc..
Santa Clara Valley Dudleya *Dudley Setchelli*	Endangered	none	On rocky outcrops in valley & foothill grasslands	Between Bayshore Hwy & Silver Cr. Rd., etc.
Santa Clara Red Ribbons *Clarkia Concinna SSp Automixa*	C2	none	On slopes and near drainages of Cismontane woodland & chaparral.	Sycamore Canyon Rd.
Fragrant Fritillary *Fritillaria Liliacea*	C2	none	Coastal Scrub, valley & foothill grassland, coastal prarie.	South of the town of Evergreen, east of San Jose.

STATUS:

E Endangered: Listed as endangered.
Threatened: Listed as threatened.
C1 Candidate 1: Sufficient biological data to support a proposal to list as threatened or endangered.
C2 Candidate 2: Existing information may warrant listing, substantial biological support for listing is lacking.
3C Withdrawn from candidacy for federal listing.
SC Special Concern: California species that has either declined in numbers or its range reduced, population is monitored to see if more study is warrented.

Data from the U.S. Fish and Wildlife Service and the California Natural Diversity Data base. July 21, 1997.

CALIFORNIA WILDLIFE HABITAT RELATIONSHIPS SYSTEM

7/18/97

Supported by

CALIFORNIA INTERAGENCY WILDLIFE TASK GROUP

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CALIFORNIA DEPARTMENT OF FISH AND GAME

Database Version: 6.0

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SPECIES SUMMARY REPORT

ID	SPECIES NAME	STATUS FE=1 FT=2 CE=3 CT=4 CP=5 CS=6 FS=7 BS=8 H=9	C	P	S
A001	TIGER/CALIF. TIGER SALAMANDER	5 6		C	
A007	CALIFORNIA NEWT	6			
A028	WESTERN SPADEFOOT	5 6			
A040	RED-LEGGED FROG	2 5 6			
A046	BULLFROG	9			
B044	DOUBLE-CRESTED CORMORANT	6			
B070	GREATER WHITE-FRONTED GOOSE	9			
B071	SNOW GOOSE	9			
B072	ROSS' GOOSE	9			
B075	CANADA GOOSE	2 9			
B076	WOOD DUCK	9			
B077	GREEN-WINGED TEAL	9			
B079	MALLARD	9			
B080	NORTHERN PINTAIL	9			
B082	BLUE-WINGED TEAL	9			
B083	CINNAMON TEAL	9			
B084	NORTHERN SHOVELER	9			
B085	GADWALL	9			
B086	EURASIAN WIGEON	9			
B087	AMERICAN WIGEON	9			
B089	CANVASBACK	9			
B090	REDHEAD	9			
B091	RING-NECKED DUCK	9			
B094	LESSER SCAUP	9			
B103	BUFFLEHEAD	9			
B104	HOODED MERGANSER	9			
B105	COMMON MERGANSER	9			
B107	RUDDY DUCK	9			
B110	OSPREY	6			
B111	WHITE-TAILED KITE	5			
B113	BALD EAGLE	2 3 5			
B114	NORTHERN HARRIER	6			
B124	FERRUGINOUS HAWK	6			
B126	GOLDEN EAGLE	5 6			
B128	MERLIN	6			
B131	PRAIRIE FALCON	6			
B133	RING-NECKED PHEASANT	9			
B143	BLACK RAIL	4 5			
B144	CLAPPER RAIL	1 3 4 5			
B148	COMMON MOORHEN	9			
B149	AMERICAN COOT	9			
B173	LONG-BILLED CURLEW	6			
B199	COMMON SNIPE	9			
B215	CALIFORNIA GULL	6			

7/18/97

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SPECIES SUMMARY REPORT

ID	SPECIES NAME	STATUS FE=1 FT=2 CE=3 CT=4 CP=5 CS=6 FS=7 BS=8 H=9	C P S
B235	BLACK TERN	6	
B273	SHORT-EARED OWL	6	
B281	VAUX'S SWIFT	6	
B338	PURPLE MARTIN	6	
B342	BANK SWALLOW	4	
B461	COMMON YELLOWTHROAT	6	
B505	SONG SPARROW	6	
B520	TRICOLORED BLACKBIRD	6	
M001	VIRGINIA OPOSSUM	9	
M003	VAGRANT SHREW	6	
M006	ORNATE SHREW	6	C
M042	WESTERN MASTIFF BAT	6	
M117	DEER MOUSE	6	
M134	CALIFORNIA VOLE	1 3 6	
M139	COMMON MUSKRAT	9	
M146	COYOTE	9	
M149	GRAY FOX	9	
M153	RACCOON	9	
M162	STRIPED SKUNK	9	
M163	NORTHERN RIVER OTTER	6	
M166	BOBCAT	9	
M177	ELK	9	
M181	MULE DEER	9	
R004	WESTERN POND TURTLE	5 6 7	
R057	GOPHER SNAKE	6	
R061	COMMON GARTER SNAKE	1 3 5 6	
R063	SIERRA/GIANT/TWO-STRIPED G. SNAKE	2 4 5	

Total Number of Species: 71

List of Preparers, Contributors & Design Team Members:

USDA, Natural Resources Conservation Service:	**Robert E. Snieckus,** State Landscape Architect, *Team Leader* **James R. Chapman**, Civil Engineer **Edward Schmit**, State Hydraulic Engineer **Andrew Fulks**, Asst. Landscape Architect **Cory Parker**, Asst. Landscape Architect **William Ward**, State Design Engineer **Jeff Rodriguez**, District Conservationist **Kevin P. Boyle**, State Economist **Arlene Tugel**, Soil Scientist **Walter E. Sykes**, Watershed Planning Specialist **Bianca V. Streif**, Fisheries Biologist **David Robledo**, Project Engineer **Laura Lundin**, Civil Engineer **Glenn I. Wilcox**, Resource Conservationist **Ronald F. Schultze**, State Biologist Mark Cocke, Civil Engineer
Santa Clara Valley Water District:	**P. K. Whitlock**, Flood Control Manager **Timmy Yung**, Civil Engineer Vickie Germany, Environmental Specialist **Gordon Lau**, Civil Engineer **Nai Hsueh**, Civil Engineer **Jose L. Ortiz**, Supervising Engineer **Rick L. Austin**, Vegetation Specialist **Mark Wander**, Maintenance Planner **Abdullah Saah**, Hydrologist **Bernard Goldner,** Head, Environmental Review Section (Retired) **Deborah S. Amshoff**, Environmental Specialist **Cindy Roessler**, Environmental Specialist **Beth Redmond**, Engineering Technition **Will Hutchinson**, Facilities Superintendent **Louisa Squires**, Wetlands Specialist
Guadalupe - Coyote Resource Conservation District:	**Nancy Bernardi**, Director **John Beall**, Director **Libby Lucas**, Director **Todd Cooper**, Director **Debra Houston**, Director **Vince Garrod**, Director **Rick Bernardi**, Associate Director
US Army Corps of Engineers:	**Mark D'Avignon**, Biologist **Jennifer Vick**, Ecologist
US Environmental Protection Agency:	**Mike Monroe**
California Dept. of Fish and Game:	**Patricia Anderson**, Area Fishery Biologist
US Fish and Wildlife Service:	**Daren Fong**, Fisheries Biologist
National Marine Fisheries:	**Michael Thabault**, Fisheries Biologist **Chris Mobely**, Fisheries Biologist
Philip Williams and Associates:	**Jeffrey Haltiner** **Larry Fishbain** **Peter Goodwin**
University of California, Berkeley	**Prof. G. Mathias Kondolf** **Lisa Micheli**

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TABLE K
SUMMARY AND COMPARISON OF CANDIDATE PLANS

PROJECT FEATURES/IMPACTS	NO PROJECT	PLAN 1 NONSTRUCTURAL	PLAN 2, CHANNEL WORK AND FLOODPROOFING (NED PLAN)
Installation Cost ($)			
PL-566	0	2,408,000	12,223,000
Local	0	602,000	1,731,000
Total Installation Cost ($)	0	3,010,000	13,954,000
Average Annual Installation Cost ($)			
PL-566	0	189,700	963,000
Local	0	47,400	136,400
Average Annual O&M Costs ($)	57,500	70,800	65,100
Total Average Annual Cost ($)	57,500	328,800[1]	1,262,600[1]
Average Annual Benefits ($)	0	635,900	1,616,300
Net Benefits ($)	0	307,100	353,700
Benefit/Cost Ratio	N/A	1.9:1.0	1.3:1.0
Average Annual Damage Reduction (%)	0	36	89
Floodwater Reduction	No additional buildings protected	207 buildings protected at 100-year event	1,272 buildings protected at 100-year event
Remaining Buildings Flooded	1,412	1,205	140
Remaining Average Annual Damages ($)	1,782,700	1,147,900	195,400
Additional Rights-of-Way Needed (Acres)	0	1.7	5.6
Residences Relocated	0	10	0
Streambank Erosion	Streambank erosion averaging 40 tons per year	Streambank erosion averaging 40 tons per year	Streambank erosion eliminated
Sediment	20,080 tons deposited on floodplain at 100-year event	20,080 tons deposited on floodplain at 100-year event	140 tons deposited on floodplai at 100-year event
Transportation	Flooding of 9 major roadways at 100-year event	Flooding of 9 major roadways at 100-year event	2 major roadways closed at 100- event
Human Health and Safety	Life threatening hazard to inhabitants of 621 homes, 1 apartment complex, and 1 school at 100-year event.	Life threatening hazard to inhabitants of 611 homes, 1 apartment complex, and 1 school at 100-year event.	Life threatening hazard to inha tants of 13 homes at 100-year event.
Visual	Continuation of present conditions	Floodwalls around 167 buildings; 35 residences elevated; 10 residences relocated	3.77 miles of concrete channel 0.27 miles of earth channel
Downstream Areas	Continuation of present conditions	Continuation of present conditions	Sediment Deposition on floodpla and into San Francisco Bay incr by 1.3 and 0.2 percent (average annual) respectively. No incre in flooding
Wetlands	Continuation of present conditions	Continuation of present conditions	Removes 1.0 Habitat Unit
Riparian	Continuation of present conditions	Continuation of present conditions	Removes 3.3 Habitat Units
Mitigation	N/A	None	Plant 6.6 acres of trees and sh

[1] Includes $20,900 for Plan 1 and $98,100 for Plan 2 in interest expense accrued during the installation period.

Table 5. Estimated Average Annual Flood Damage Reduction Benefits

Lower Silver Creek Watershed, California

(Dollars)

Item	Estimated Average Annual Damage Without Project	Estimated Average Annual Damage With Project	Damage Reduction Benefit
Floodwater			
Nonagricultural			
Buildings and improvements	$1,972,890	$195,315	$1,777,575
Vehicles	$357,780	$54,902	$302,877
Transportation Disruption	$27,344	$9,161	$18,183
Emergency Services	$20,202	$3,463	$16,739
Subtotal	$2,378,215	$262,841	$2,115,374
Sediment			
Overbank Deposition	$17,722	$0	$17,722
Subtotal	$17,722	$0	$17,722
Total	$2,395,937	$262,841	$2,133,096

Table 6. Comparison of NED Benefits and Costs

Lower Silver Creek Watershed, California

(Dollars)

Evaluation Unit	Flood Prevention Damage Reduction	Savings in Future Costs	Total	Average Annual Cost	Benefit Cost Ratio
Structural					
Channel	$2,129,016	$245,708	$2,374,724	$2,281,845	1.04
Nonstructural					
Floodproofing	$4,080	$0	$4,080	$1,607	2.54
Grand Total	$2,133,096	$245,708	$2,378,804	$2,283,452	1.04

Updated Costs and Benefits – Lower Silver Creek

The Benefits and Costs for the Lower Silver Creek flood control project were updated from their 1982 base to 1993. The indices used for the updates and the method used for each category of benefits and costs are shown in Appendices A,B and C.

Summary of FWOP Damages with all studies involved.

Total FWOP Damages
(Average Annual)

	1982 Estimates	1993 Estimates
1. Buildings, Contents and Yards (w/o OBERS)	$1,333,300	$1,799,955
2. OBERS	$128,100	$172,935
3. Auto Damage	$273,700	$357,780
4. Transportation Disruption Damages	$19,700	$27,344
5. Sediment and Debris Clean Up Costs on Streets	$13,900	$17,722
6. Emergency Services Costs	$14,000	$20,202
Total	$1,782,700	$2,395,937

Appendix A. Updated Indices and Methods

The following sections describe how costs and benefits that were calculated in 1982 for the Lower Silver Creek flood prevention project were updated.

1. Buildings, Contents and Yards (w/o OBERS)

The original study calculated damages in this category by using Marshall and Swift replacement cost estimates for the buildings in the study area. Damages were calculated as a percent of this replacement cost (averge annual damages was the area under a damage curve for various storm frequencies).

To update these damages, cost indices were taken from Marshall and Swift's "Marshall Valuation Service" (see Tables 1 and 2) for January, 1993, as follows:

Two indices could be used:

a) Southwest Average Comparative Cost Index	
January, 1993 index:	1.29
b) San Francisco Comparative Cost Index	
January, 1993 index:	1.383

San Jose is believed to more similar to San Francisco building costs, but not quite as high. The San Francisco index was lowered to 1.35 for this update.

This index is based on Class D buildings, which are wood framed. Not all the buildings in this study were wood framed; buildings constructed in a different manner have lower cost indices. These other buildings accounted for a very minor share of total damages and therefore the 1.35 factor was used for all buildings.

	FWOP Damages 1982	Cost Index	FWOP Damages 1993
Buildings, Contents and yards			
Average Annual	$1,333,300	1.35	$1,799,955
Total	$24,183,800	1.35	$32,648,130

This index works for estimating content and yard damages because the original study based these estimates on a percentage of replacement cost.

2. OBERS

The original study used OBERS data to project growth in per capita income in this area. This was done in order to account for an increase in value of the contents of residences. The original damage estimates were multiplied by this OBERS factor. This simple multiplication allows the same cost index multiplier used in part 1 to be applied to the OBERS damages as follows:

	FWOP Damages 1982	Cost Index	FWOP Damages 1993
OBERS			
Average Annual	$128,100	1.35	$172,935
Total	$26,818,200	1.35	$36,204,570

3. Auto Damages

The original study inventoried and valued automobiles that would be damaged by flood events. The total damage from each event was estimated by multiplying the value of the car by damage coefficients for the flood events. A damage frequency curve was then built and the area under the curve determined annual average damages.

Because the value of cars were the prime determinant of auto damages, this value was updated to 1993 levels. The Consumer Price Index includes indices for new and used cars (see Table 3). These indices were added together and an average new and used car index was derived. The new index was then used to update the 1982 auto damage estimate.

	Consumer Price Index		
Year	New Cars	Used Cars	Average
1982	97.4	88.8	93.1
1991	125.3	118.1	121.7

The following formula was then used:
Old Damage Estimate x 1991 Avg. CPI / 1982 Avg. CPI

Old Damage Estimate	$273,700
1991 CPI	121.7
1982 CPI	93.1
Updated Damages	$357,780

4. Transportation Disruption Damages

The original study based these damages on two economic values: the IRS allowable deduction per mile and the hourly wages of truck drivers. The total damages from rerouting traffic due to flood events was then plotted for each storm event and the area under the curve gave annual average damages.

These damages were updated as follows:
a) The IRS mileage deduction allowance was updated to current values.

1982 IRS Mileage Allowance:	$0.20
1993 IRS Mileage Allowance:	$0.28
Per cent increase	40.00%

This accounted for 76% of damages in the original study and received a corresponding weight for this update.

b) The California Employee Development Department provided the following data for updating truck driver hourly wages (data was only available through 1991, wages are not believed to have fallen so this will result in a conservative adjustment).

	Beginners	Journeyman
1983 Teamster wages	$8.00	$15.00
1991 Teamster wages	$12.75	$19.90
Per cent increase	59.38%	32.67%

The original study used a wage rate of $13.84 which slants toward the journeyman wage rate. A 35% increase was considered fair and reasonable.

	1982	Multiplier	1991 wage rate
Truck driver wage rate	$13.48	1.35	$18.20

This accounted for 24% of damages in the original study and was weighted accordingly.

c) Weighted Damage Update

	1982	Multiplier	1993
Transportation Disruption Damages			
a) Mileage	$14,972	1.4	$20,961
b) Truck driver	$4,728	1.35	$6,383
c) Total	$19,700		$27,344

5. Sediment and Debris Clean up Costs on Streets

The original study used damage clean up estimates provided by the city of San Jose. The same department was contacted but stated that they no longer calculate clean up costs in the manner used in the study. They suggested using a construction cost index to update the original numbers.

A construction cost index from the Engineering News Record (see Table 4) was used to update these damages as follows:

	ENR CCI Index
1982	4993.3
Mar., 1993	6366.2

The following formula was then used for updating:
Old damage estimate x 1992 index / 1982 index = updated estimate

1982 Damage Estimate	$13,900
Updated Estimate	$17,722

6. Emergency Services

The original study included a wide variety of activities that would occur in the event of flooding, including cost categories such as: food, shelter, transportation and personnel. Total costs for each storm event were plotted and the area under a damage frequency curve was used to derive annual average damages.

The variety of activities involved in this category pointed to the Consumer Price Index as being a good cost index. The CPI for all urban consumers in the San Francisco–Oakland–San Jose area (see Table 5) was then used as follows:

	CPI
1982	100
Oct., 1992	144.3

The following formula was then used for updating:
Old damage estimate x 1992 index / 1982 index = updated estimate

1982 Damage Estimate	$14,000
Updated Estimate	$20,202

8. FIA Administrative Costs

The original study did not include this category when considering the future without project scenario. New SCS procedures (see attached National Bulletin 200–2–2–) indicate these costs should be included.

# of Policies	Cost per Policy	Total Cost
1260	226	$284,760

Appendix B. Updated Residual Damages and Benefits

The same method used to update each category of benefits in Appendix "A" was used to update the residual damages expected upon construction of the best alternative. These updates are summarized in this appendix.

Summary of Residual Damages and Benefits
1% channel
(Average Annual)

	1982 Estimates	1993 Estimates	1993 Benefits
1. Buildings, Contents and Yards (w/o OBERS)	$134,800	$181,980	$1,617,975
2. OBERS	$12,900	$17,415	$155,520
3. Auto Damage	$42,000	$54,902	$302,877
4. Transportation Disruption Damages	$6,600	$9,161	$18,183
5. Sediment and Debris Clean Up Costs on Streets	$0	$0	$17,722
6. Emergency Services Costs	$2,400	$3,463	$16,739
Total	$198,700	$266,921	$2,129,016

1. Building Contents and Yards

	1982 Damages	Cost Index	1993 Damages
a) Average Annual	$134,800	1.35	$181,980
b) Total	$1,921,300	1.35	$2,593,755

2. OBERS

	1982 Damages	Cost Index	1993 Damages
a) Average Annual	$12,900	1.35	$17,415

3. Auto Damage

Old Damage Estimate	$42,000
1991 CPI	121.7
1982 CPI	93.1
Updated Damages	$54,902

4. Transportation Disruption

	1982	Multiplier	1993
a) Mileage	$5,016	1.4	$7,022
b) Truck driver	$1,584	1.35	$2,138
c) Total	$6,600		$9,161

5. Sediment Clean Up

The original study found that no damages would occur in this category once this alternative was constructed.

6. Emergency Services

1982 Damage Estimate	$2,400
1982 CPI Index	100
October, 1992 CPI index	144.3
Updated Estimate	$3,463

7. FIA Administrative Costs Avoided

The original study included an estimated reduction in flood insurance policy administrative costs by FEMA. New SCS procedures (see attached National Bulletin 200–2–2) estimate these costs in a different manner. The new method was used as follows:

	# of Policies	Cost per Policy	Total Cost
Without Project	1260	$226	$284,760
With Alternative			
a) terminated	1159	$14	$16,226
b) remaining in force	101	$226	$22,826
Subtotal			$39,052
Benefits			$245,708

8. Floodproofing

The original study includes an estimated cost for this nonstructural category. The Engineering News Review Construction Cost Index (table 4) was used to update this item.

1982 Estimated Floodproofing Cost	$3,200
1982 ENR CCI Index	4993.3
June, 1992 ENR Index	6366.2
Updated Floodproofing Costs	$4,080

Appendix C. Updated Construction and Real Estate Costs

1. Construction Costs

The Engineering News Record Cost Indice for Construction Costs (CCI) were used to update 1982 construction costs to 1993 levels. The following formula was used:

1982 Cost Estimate x (March, 1993 CCI index / Dec., 1992 Cost Index) = New Cost Estimate

ENR cost indices for San Francisco were used (see Table 4).

March, 1993 CCI index = 6366.2
December, 1982 CCI index = 4993.3
Update Factor = 1.274948

The project Civil Engineer also changed the baseline, 1982 construction specs. and cost estim

2. Real Estate Costs

Footnote 2 to Table 2 explains how real estate values were updated.

3. Latest Version

The tables below reflect engineering changes made as of 1-24-94

Table 1. ESTIMATED INSTALLATION COST

Lower Silver Creek Watershed, California

Note: All the t
the recommend

			Estimated Cost (Dollars) /1		
			PL-566	Other	
Installation Cost Item	Unit	Number	SCS	SCS	Total
NONSTRUCTURAL MEASURES					
Floodproofing	Structures	2	10,200	2,550	12,749
SUBTOTAL NONSTRUCTURAL			10,200	2,550	12,749
STRUCTURAL MEASURES					
Channel Work:	Miles	4.64	19,572,460	6,059,377	25,631,837
SUBTOTAL STRUCTURAL			19,572,460	6,059,377	25,631,837
TOTAL PROJECT			19,582,660	6,061,927	25,644,587

/ 1 - Price updated to March, 1993 using Engineering News Record Cost Indice and current market values for real estate

2/4/94

TABLE 2. ESTIMATED COST DISTRIBUTION
STRUCTURAL AND NONSTRUCTURAL MEASURES
Lower Silver Creek Watershed, California
(Dollars) /1

	INSTALLATION COST -- PL-566 FUNDS				INSTALLATION COST -- OTHER FUNDS					Total Installation Cost
Item	Construction	Engineering	Project Administration	Total PL-566	Construction	Engineer.	Land Rights	Project Administ.	Total Other	
STRUCTURAL MEASURES (M)										
Channel Work										
0+50 to 40+50	2,116,414	126,985	232,806	2,476,205			825,256	2,550	827,806	3,304,011
40+50 to 53+25	1,642,134	98,528	180,635	1,921,296			5,100	1,275	6,375	1,927,671
53+25 to 123+78	2,574,121	154,447	283,153	3,011,721			2,596,252	22,949	2,619,202	5,630,923
123+78 to 170+00	4,214,980	252,899	463,648	4,931,526			1,411,368	155,544	1,566,912	6,498,438
170+00 to 201+60	2,458,101	147,486	270,391	2,875,978			915,413	101,996	1,017,409	3,893,387
201+60 to 244+61	3,322,516	199,351	365,477	3,887,343			20,399	1,275	21,674	3,909,017
Mitigation	400,334	24,020	44,037	468,391						468,391
SUBTOTAL STRUCTURES	16,728,598	1,003,716	1,840,146	19,572,460			5,773,789	285,588	6,059,377	25,631,837
NONSTRUCTURAL MEASURES										
Floodproofing	7,650	1,275	1,275	10,200			1,275	1,275	2,550	12,749
SUBTOTAL NONSTRUCTURAL	7,650	1,275	1,275	10,200			1,275	1,275	2,550	12,749
GRAND TOTAL	16,736,248	1,004,991	1,841,421	19,582,660			5,775,064	286,863	6,061,927	25,644,587

/1 - 1982 Costs updated to 1993 costs using the Engineering News Review Cost Indice

/2 - Land Right costs were updated by using the 1993 ENR cost indice for non real estate costs and the current estimated market value of real estate in this area for proposed land purchases. Land purchases include 1.26 acres in Reach One and 4.35 acres in Reach Three The 1.26 acres consisted of an estimated 88% commercial and 12% residential property mix. The 4.35 acre consisted of an estimated 95% residential and 5% commercial property mix. Residential land was valued at $12.50 per square foot and commercial vacant land was valued at $15.00 per square foot.

STRUCTURAL AND NONSTRUCTURAL MEASURES

Lower Silver Creek Watershed, California

(Dollars) /1

	COST ALLOCATION	COST SHARING		
	Purpose			
Item	Flood Prevention	PL-566	Other	Total
STRUCTURAL MEASURES				
Construction	16,728,598	16,728,598		16,728,598
Engineering	1,003,716	1,003,716		1,003,716
Land Rights	5,773,789		5,773,789	5,773,789
Project Administrat.	2,125,734	1,840,146	285,588	2,125,734
SUBTOTAL	25,631,837	19,572,460	6,059,377	25,631,837
NONSTRUCTURAL MEASURES				
Floodproofing				
Construction	7,650	7,650		7,650
Engineering	1,275	1,275		1,275
Land Rights	1,275		1,275	1,275
Project Administratio	2,550	1,275	1,275	2,550
SUBTOTAL	12,749	10,200	2,550	12,749
GRAND TOTAL	25,644,587	19,582,660	6,061,927	25,644,587

/ 1 - 1982 costs updated to 1993 by using the Engineering News Review Cost Indice and current market values for real estat

2/4/94

TABLE 4. ANNUALIZED ADVERSE NED EFFECTS

Lower Silver Creek Watershed, California

(Dollars) /1

	PROJECT OUTLAYS		OTHER PROJ. COST	
Evaluation Unit	Amort. of Inst. Cost	Operation,Main. & Replace. C. /2	Interest during Installation /3	Total
NONSTRUCTURAL				
Floodproofing	$1,100	$380	$127	$1,607
STRUCTURAL				
Channel Work	$2,115,400	$41,500	$124,945	$2,281,845
GRAND TOTAL	$2,116,500	$41,880	$125,072	$2,283,452

1/ Discounted over 100 years at an interest rate of 8.25

2/ Includes $37,500 for construction O & M and $4000 for mitigation O & M (8 acres x $500/acre)

3/ ENR Cost Indice used with 1982 interest calculation

2/4/94

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
3310 El Camino Avenue, Suite 130
Sacramento, California 95821-6340

IN REPLY REFER TO:
1-1-97-TA-1867

August 6, 1997

Mr. Robert E. Snieckus
State Landscape Architect
U.S. Department of Agriculture
Natural Resources Conservation Service
2121-C Second Street
Davis, California 95616

Subject: Potential Impacts on California Red-legged Frogs from Proposed Lower Silver Creek Watershed Project, Santa Clara County, California

Dear Mr. Snieckus:

Thank you for contacting the U.S. Fish and Wildlife Service (Service) regarding the proposed Lower Silver Creek Watershed Project, and potential project effects to California red-legged frogs (*Rana aurora draytonii*) residing in Lower Silver Creek. California red-legged frogs are protected under the Federal Endangered Species Act of 1973, as amended (Act).

Section 9 of the Act and its implementing regulations prohibit the "take" of federally listed fish and wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any listed wildlife species. "Harm" in this definition includes significant habitat modification or degradation where it actually kills or injures wildlife, by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR § 17.3).

Based on the project description and results of field surveys dated June 11, 1997, and received in our office June 19, 1997, the Service has determined that take of the California red-legged frog is not likely to occur. Therefore, the project as proposed is in compliance with the Act, with the understanding that take is not authorized under this agreement.

Thank you for your interest in conserving threatened and endangered species. Please contact Mike Westphal in the Endangered Species Division, Coast/Bay/Delta Branch at (916) 979-2739 extension 437, if you have any questions regarding these comments.

Sincerely,

Dale A. Pierce

for Wayne S. White
Field Supervisor

cc: AES, Portland, OR
SFO-Wetlands, Sacramento, CA
CDFG, Yountville, CA

DRAFT

July 27, 1998
5:02 PM

XI Cultural Resources

Background

A records search utilizing the resources of the now Northwest Information Center, California Historical Resources File System, was conducted in May 1982. At that time no recorded archeological or historical properties were noted within or adjacent to the project area. Archeological surveys were conducted along Lower Silver Creek in 1973 and 1975. No evidence of archeological sites were noted within or adjacent to the project area.

Results of the records search and the archeological surveys conducted for the SCVWD along the entire length of Lower Silver Creek from Lake Cunningham to Coyote Creek were sent to the State Historic Preservation Officer for review.

The above information is contained in the Lower Silver Creek Watershed Final Watershed Plan and Environmental Impact Statement/Report, Santa Clara County, California, July 1983 (EIR).

The Existing Resources portion (page 28) of the EIR contains an inventory of buildings located in the floodplain. This was last updated in late 1981. This section contains information on the types of buildings and the age of the buildings. Of significance is that in 1981 300 to 400 buildings in the floodplain were built prior to 1950. Locations were not identified. It is possible some of these structures are within the area of potential effects for work proposed to be accomplished. It is also possible some could be listed as historic structures and/or others are eligible for inclusion in the National Register of Historic Places.

NRCS Applicability and Exceptions

NRCS technical assistance which doesn't result in any change to cultural resources or provided as information at the request and subsequent control of the landowner is not considered an undertaking as defined in the Programmatic Agreement (PA) between the Advisory Council on Historic Preservation and the National Council of State Historic Preservation Officers. This includes NRCS activities that are considered forms of nonintrusive data collection such as the Lower Silver Creek Watershed Plan Update.

Project Implementation

Lead Agency Responsibilities

Natural Resources Conservation Service:

The NRCS is responsible for cultural resources compliance in all actions where NRCS is considered the lead agency. NRCS activities would include when NRCS has legislated responsibility or designated Departmental authority to administer specific Federal programs or when providing to nonfederal participants direct, single agency actions of technical and/or financial assistance that may effect cultural resources.

In these situations NRCS will fulfill its National Historic Preservation Act Section 106 requirements in accordance with its Programmatic Agreement (PA) by:

a. determining if the proposed activity is considered an undertaking by the PA.

b. conduct a cultural resources review by contacting the appropriate Information Center of the California Historical Resources File System and requesting information on known resources and surveys in the area of the proposed activity.

c. conduct a site visit to the location and complete a field inspection of the area to relocate previously known cultural resources and/or possibly locate new cultural resources.

Other Federal Agencies:

Other Federal agencies involved in a proposed project or activity are responsible for initiating and completing the Federal review process designed to ensure that historic properties are considered during Federal project planning and execution (Section 106 process).

State Agencies:

SCVWD and other state agencies

The California Environmental Quality Act (CEQA) (Public Resources Code Sections 21000 et seq.) requires that lead agencies must identify and examine the significant adverse environmental effects from a project before approving it.

When a project may adversely affect a unique archeological resource Section 21083.2 of CEQA requires the lead agency to treat that effect as a significant environmental effect. If an archeological resource is listed in or eligible to be listed in the California Register of Historical Resources, Section 21084.1 of CEQA requires that any substantial adverse effect to that resource be considered a significant environmental effect. In both cases an environmental impact report (EIR) must then be prepared.

Private Individuals:

The State legislature recognizes the preservation and enhancement of historical properties is largely based on the good will and cooperation of the general public along with the owners of historic resources. California Public Resources Code, Government Code, Health and Safety Code, and Penal Code contains numerous references to the preservation and enhancement of historical resources.

At the very minimum, the destruction, defacement or destruction of any object or thing of archeological or historical value, whether on public or private lands is in violation of the penal code.

/home/reioux/word/cultres/waterresources/lsilver1.dcx

April 29, 1996

Jerry Reioux
Bob Snieckus

Here is documentation of compliance with 36 CFR 800 for the Lower Silver Creek project. This is referred to on pages 27 and 88 of the 1983 FEIS. In addition, Appendix A in the FEIS includes a letter from the State Resources Agency that specifically identifies the Department of Parks and Recreation (which included the SHPO) as participating in the review and says that the state had no comments or recommendations. In other words, the EIS itself already demonstrates compliance, at least to those who know the procedure.

There is also earlier correspondence in the file if you need it.

Walt Sykes

36 CFR 800

Disagreement about National Register eligibility of properties found

(4) If the Agency Official and the State Historic Preservation Officer do not agree, or if the Council or the Secretary so request, the Agency Official shall obtain a determination from the Secretary of the Interior pursuant to applicable National Park Service regulations.

(5) If the State Historic Preservation Officer does not provide views, then the State Historic Preservation Officer is presumed to agree with the Agency Official's determination for the purpose of this subsection.

Agency's actions if no historic properties are found

(d) **When no historic properties are found.** If the Agency Official determines in accordance with Sections 800.4(a)-(c) that there are no historic properties that may be affected by the undertaking, the Agency Official shall provide documentation of this finding to the State Historic Preservation Officer. The Agency Official should notify interested persons and parties known to be interested in the undertaking and its possible effects on historic properties and make the documentation available to the public. In these circumstances, the Agency Official is not required to take further steps in the Section 106 process.

Agency's actions if historic properties are found

(e) **When historic properties are found.** If there are historic properties that the undertaking may affect, the Agency Official shall assess the effects in accordance with Section 800.5.

Agency's assessment of project effects on historic properties found

800.5 Assessing effects.

Agency's use of Criteria of Effect

(a) **Applying the Criteria of Effect.** In consultation with the State Historic Preservation Officer, the Agency Official shall apply the Criteria of Effect (Section 800.9(a)) to historic properties that may be affected, giving consideration to the views, if any, of interested persons.

Agency's actions if no effect is found

(b) **When no effect is found.** If the Agency Official finds the undertaking will have no effect on historic properties, the Agency Official shall notify the State Historic Preservation Officer and interested persons who have made their concerns known to the Agency Official and document the finding, which shall be available for public inspection. Unless the State Historic Preservation Officer objects within 15 days of receiving such notice, the Agency Official is not required to take any further steps in the Section 106 process. If the State Historic Preservation Officer files a timely objection, then the procedures described in Section 800.5(c) are followed.

Agency's use of Criteria of Adverse Effect

(c) **When an effect is found.** If an effect on historic properties is found, the Agency Official, in consultation with the State Historic Preservation Officer, shall apply the Criteria of Adverse Effect (Section 800.9(b)) to determine whether the effect of the undertaking should be considered adverse.

Agency's actions if effects are not adverse

(d) **When the effect is not considered adverse.**

(1) If the Agency Official finds the effect is not adverse, the Agency Official shall:

(i) Obtain the State Historic Preservation Officer's concurrence with the finding and notify and submit to the Council summary documentation, which shall be available for public inspection; or

2828 Chiles Road
Davis, CA 95616
(916) 758-2200

October 4, 1982

Dr. Knox Mellon
State Historic Preservation Officer
Office of Historic Preservation
P.O. Box 2390
Sacramento, CA 95811

Dear Dr. Mellon:

This letter is in reference to your letter of July 20, 1982 and a subsequent telephone conversation in August with Mr. Del Cioppo of your staff regarding the concerns you have on impacts of the Lower Silver Creek watershed project to archaeological and historical resources.

We sent copies of the East Zone Flood Control EIR and the EIR for the proposed Lower Silver Creek Flood Control Project for review by the California Archaeological Inventory at Sonoma State University. They concur that no archaeological sites will be affected by the project. A copy of their letter is enclosed for your information.

Two concerns you had and also expressed by the Center, were the source of materials to be used for construction of levees and the need to evaluate the historical significance of structures that will be altered or demolished by the project.

Fill material to be used for construction of levees will come from channel excavation in the project right of way which has already been surveyed for archaeological resources. Should archaeological resources be discovered during channel excavations, we will immediately notify your office and follow the requirements of SCS Procedures for the Protection of Archaelogical and Historical Properties Encountered in SCS-Assisted Programs (CFR-656).

The only structures to be removed by the project are five bridges, four of which were built in 1958 and one in 1979. These bridges have no historical significance.

Based on this information, we feel that the Lower Silver Creek watershed project will not impact any archaeological or historical resources. We would appreciate any further comments you may have.

If there are any questions, please contact Steve Crow, Watershed Planning Staff, at (916) 758-2200.

Sincerely,

EUGENE E. ANDREUCCETTI
State Conservationist

Enclosure

USDA:SCS:SCROW:yf:10/04/82

California
Archaeological
Inventory

ALAMEDA
CONTRA COSTA
DEL NORTE
HUMBOLDT
LAKE
MARIN
MENDOCINO
NAPA
SONOMA

Northwest Information Center
Department of Anthropology
Sonoma State University
Rohnert Park, California 94928
(707) 664-2494

20 August 1982

File No.: 6080-1440-U

Steven Crow
Soil Conservationist
Soil Conservation Service
U.S.D.A.
2828 Chiles Road
Davis, CA 95616

re: Lower Silver Creek Watershed Work Plan in San Jose, Santa Clara County.

Dear Mr. Crow:

I write in response to your letter dated 13 August 1982 which was accompanied by two archaeological survey reports. These surveys were conducted in 1973 and 1974. At that time, archaeological information for Santa Clara County was archived at Cabrillo College in Santa Cruz. Archaeological information for the county has since been transferred to us. Evidently, neither Cabrillo nor this office ever received copies of the reports on Lower Silver Creek. This was common for the "early days" when the prototypes of existing Information Centers were just developing.

Apparently the two survey reports written by staff of the Adam E. Treganza Anthropology Museum covered the present project area. In view of this, and since no archaeological sites that could potentially be impacted by this project were discovered, I hereby rescind our previous recommendation dated 4 June 1982 for archaeological survey. However, the 1973 recommendations for consulting an historian (pg. 24) and in regards to borrow areas (also pg. 24) should be noted.

Thank you for forwarding the reports to us. They will be mapped and filed so that future studies can benefit from their results. If you have any questions or if we can be of further assistance, please call or write us at the Center.

Sincerely,

Allan G. Bramlette

Allan G. Bramlette
Assistant Coordinator

AGB:lm